RLB Rider Levett Bucknall

RIDERS DIGEST 2023

SINGAPORE EDITION

CELEBRATING 50 YEARS IN SINGAPORE

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RIDERS DIGEST
16TH EDITION

2023

Rider's Digest is a yearly publication from RLB's Research & Development department. It is a compendium of cost information and related data on the Singapore construction industry.

Cost information in this publication is indicative and for general guidance only. All prices and rates are as at December 2022 and expressed in Singapore Dollars unless otherwise stated. References to legislative provisions and regulations are as at First Quarter 2023. Changes after this period will not be reflected.

All figures are rounded and exclude GST.

MCI (P) 058/04/2023

Founders' Memorial, Singapore

INTRODUCTION

TOWARDS THE NEXT 50 YEARS

Rider Levett Bucknall celebrated 50 years of industry leadership and service excellence in Singapore last year. We take pride in upholding the respect and trust conferred by clients and industry peers in our cost advisory services, forging invaluable ties that have stood the test of time. In the next 50, we are committed to continuing this legacy through our dedication to understanding client needs and providing true value-add.

One of our key strengths is our rich repository of cost data, enabling us to provide market intelligence on cost and procurement. In the midst of market volatility and potential global economic crisis threatening to push construction prices to new highs, reliable and up-to-date cost advice are crucial in establishing realistic construction budgets.

This year, our iconic pocket-size Rider's Digest handbook is back by popular demand, while also keeping the digital booklet available on our website. We wish to reassure you that Rider Levett Bucknall is committed to minimising our environmental impacts, even as you hold this booklet in your hands. Sustainability remains at the forefront of our business activities, without compromising on our services to our clients and peers.

We trust that the research data provided herein will assist and empower all our valued partners to bring your projects and imagination to life. We look forward to working together with you to shape the future of the built environment and to create a better tomorrow.

Silas Loh and Colin Kin
Managing Directors, Singapore Office
Rider Levett Bucknall

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Singapore Flyer, Singapore

SINGAPORE CONSTRUCTION COST TRENDS

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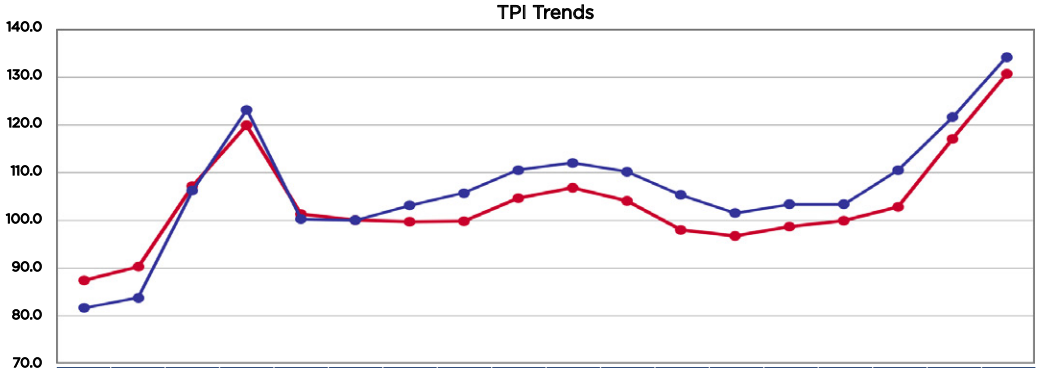
SINGAPORE CONSTRUCTION TRENDS

TENDER PRICE INDICES (TPI) (YEAR 2010 = 100)



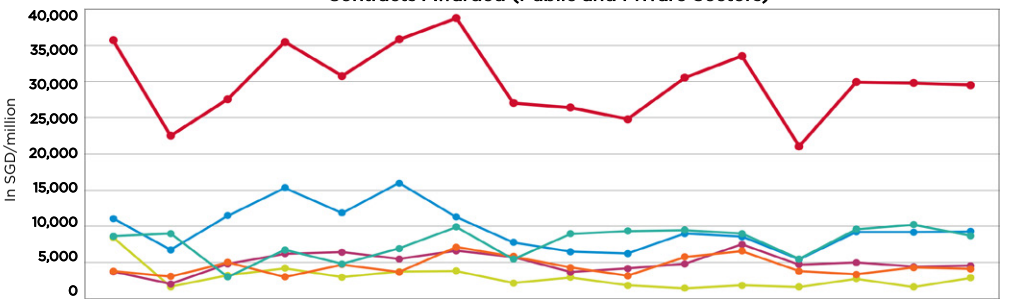
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BCA	87.4	90.2	107.1	119.9	101.3	100	99.7	99.8	104.6	106.8	104.0	98.0	96.7	98.6	99.9	102.8	117.1	130.7
RLB	81.6	83.7	106.2	123.2	100.2	100	103.1	105.7	110.5	112.0	110.2	105.3	101.5	103.3	103.3	110.5	121.6	134.2

Variances between the RLB and the BCA TPI arise from differences in the index derivation methodology, the basket of items and weightages used for each index and the variety of building projects utilised. The index basket here excludes piling works and Mechanical & Electrical services.
With effect from the 1st Quarter of 2015, BCA has implemented the new TPI series with Base Year 2010 = 100. The TPI chart shown above has been amended accordingly to reflect the Base Year as Year 2010.

Source: BCA, RLB

SINGAPORE CONSTRUCTION TRENDS

PUBLIC & PRIVATE SECTOR CONTRACTS AWARDED FOR TOTAL WORKS



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023f
RESIDENTIAL	11,074	6,734	11,487	15,298	11,846	15,963	11,290	7,770	6,479	6,250	9,019	8,570	5,439	9,226	9,189	9,300
COMMERCIAL	8,455	1,650	3,237	4,210	2,990	3,728	3,823	2,183	2,962	1,859	1,458	1,845	1,624	2,759	1,645	2,900
INDUSTRIAL	3,741	2,040	4,790	6,221	6,418	5,490	6,628	5,778	3,676	4,177	4,808	7,506	4,705	4,988	4,438	4,550
INSTITUTIONAL & OTHERS	3,796	3,075	5,028	3,018	4,697	3,682	7,113	5,828	4,312	3,166	5,787	6,586	3,784	3,351	4,295	4,100
CIVIL ENGINEERING WORK	8,618	9,019	3,023	6,741	4,810	6,941	9,903	5,474	8,974	9,346	9,464	9,017	5,494	9,610	10,220	8,700
TOTAL	35,684	22,518	27,565	35,488	30,761	35,804	38,757	27,034	26,404	24,799	30,535	33,524	21,045	29,934	29,786	29,500

f: Average forecast construction demand for 2023 is S$27 - S$32 billion
Note: BCA's published information as at 3 February 2023.

Source: BCA

SINGAPORE CONSTRUCTION TRENDS

AVERAGE PRICES OF BASIC CONSTRUCTION MATERIALS

YEAR	ORDINARY PORTLAND CEMENT (S$ PER TONNE)	STEEL BARS[1] (S$ PER TONNE)	GRANITE[2] (20MM AGGREGATE) (S$ PER TONNE)	READY-MIXED CONCRETE (GRADE 30) (S$ PER M³)	READY-MIXED CONCRETE[3] (GRADE 35/40) (S$ PER M³)	CONCRETING SAND[2] (S$ PER TONNE)
2000	71.28	458.50	12.50	71.32		
2001	70.04	432.81	12.67	61.40	-	-
2002	66.88	442.88	12.65	55.40	-	-
2003	71.13	583.93	12.25	56.75	-	-
2004	76.76	863.40	12.57	62.50	-	-
2005	85.20	738.44	16.29	72.09	-	-
2006	88.02	731.13	16.58	73.99	-	14.63
2007	100.85	873.19	31.74	138.13	138.93	45.77
2008	122.21	1,400.64	24.71	-	125.85	36.97
2009	103.23	765.80	19.68	-	104.73	29.95
2010	89.14	833.41	19.63	-	95.44	28.19
2011	93.78	931.26	21.58	-	108.99	25.96
2012	100.87	887.13	21.26	-	110.23	24.10
2013	100.23	766.90	20.61	-	106.85	22.99
2014	97.93	653.90	22.45	-	111.15	23.25
2015	92.97	501.40	19.71	-	99.47	22.68
2016	82.95	500.52	15.43	-	85.01	18.30
2017	75.91	688.83	16.07	-	81.42	17.12
2018	78.08	786.43	17.21	-	85.15	18.59
2019	82.68	741.87	18.49	-	93.88	26.66
2020	85.85	725.45	18.44	-	94.78	24.94
2021	91.75	1,046.57	19.58	-	99.91	23.59
2022	115.14	1,135.05	20.33	-	115.62	23.83

[1] - Market prices of Steel bars (without cut & bend):
Jan 09-Dec 14: Based on fixed price supply contracts with contract period 6 months or less.
Jan 15-Current: Based on fixed price supply contracts with contract period 1 year or less.

Note: Prices of rebar other than 16-32mm dimensions may be subject to surcharge.

[2] - Market prices exclude local delivery charges to concrete batching plants.

[3] - Market prices of Ready Mixed Concrete:
Jan 99-Dec 06: Based on Grade 30.
Jan 07-Dec 09: Based on contracts with non-fixed price, fixed price and market retail price for Grade 35 pump.
Jan 10-Current: Based on contracts with non-fixed price, fixed price and market retail price for Grade 40 pump.

Source: BCA

Mandai Park, Singapore

SINGAPORE CONSTRUCTION COST DATA

Central Business District (CBD)
The Central Business District is within the Central Area of Singapore, which consists of eleven urban planning areas - Downtown Core, Marina East, Marina South, Museum, Newton, Orchard, Outram, River Valley, Rochor, Straits View and Singapore River as defined by the Urban Redevelopment Authority (URA). It is the prime area of all the commercial and financial activities in the region.

Construction Floor Area (CFA)
CFA is the area of all building enclosed covered spaces measured to the outside face of the external walls including covered basement and above ground car park areas.

Gross Floor Area (GFA)
GFA is the area of building enclosed covered spaces excluding carpark and driveway areas calculated for purposes of planning submissions (refer to Page 61: Gross Floor Area for more information).

Net Lettable Area (NLA)
NLA is the total tenancy area designated for rentable purposes, i.e. areas used by tenants where rents are charged.

Building Works
Building Works include substructure (piling, foundation, and basement), super-structure, architectural works, finishes and fittings, external works, site works, preliminaries, attendance and other builder's work in connection with services.

Building Services
Building Services include Mechanical services - air-conditioning and mechanical ventilation, fire protection system, sanitary and plumbing; Electrical services – electrical installations, vertical transportation, building management systems; preliminaries. Exclusions: Special equipment – chutes, incinerators, compactors, pneumatic refuse disposal system, facade maintenance equipment, engineered smoke control system, private telephone system; audio video, IT systems, etc.

Office
Offices within CBD refers to good quality office buildings for the upper range rental market and leading owner occupiers such as headquarter offices for financial institutions and major companies. Office outside CBD refers to medium quality office buildings built for middle range rental market.

Hotel (including FF&E)
Types of hotels listed are based on 'five-star', 'four-star' and 'three-star' international hotel ratings. Costs include furniture, fitment and equipment (FF&E) but exclude hotel equipment and operating supplies.

Retail
Shopping malls with typical amenities and finishes at common spaces. Tenancy fit-outs are typically excluded in construction costs.

Condominium
The quality of finishes required will affect the cost range. Range given is significantly affected by the height, configuration of the building and existing ground conditions. Costs exclude show flats, loose furniture, special light fittings, household electrical appliances, kitchen equipment and building owners' special requirements.

Landed Residential
Landed housings are private low-rise/low density residential developments. The quality of finishes selected will affect the cost range. Costs exclude furniture, household electrical appliances, kitchen equipment and building owners' special requirements.

Institutional
Institutions include tertiary educational schools such as universities, polytechnics and other colleges that require full range of educational facilities and amenities.

Industrial
Quality reflects a simplified type of construction suitable for light or heavy industries. Costs exclude special and operating equipment, processing plant and proprietary systems.

Car Park
Above Grade car parks are multi-storey car park with minimal external walling and exclude mechanical ventilation. Basement carparks are underground car park with diaphragm wall or contiguous bored piles walls with standard mechanical ventilation provisions.

Healthcare
Healthcare developments are institutional buildings with health and medical services, such as hospitals, nursing homes, medical centres and polyclinics and clinics. Costs exclude specialist medical equipment.

SINGAPORE CONSTRUCTION COST DATA

BUILDING CONSTRUCTION PRICES

All construction prices for Singapore stated here are indicative only as at 4th Quarter 2022. Items generally excluded from the order of costs are land costs, legal and professional fees, development charges, authority fees, finance costs, loose furniture, fittings, equipment and works of art (unless otherwise stated), tenancy works such as but not limited to sub-divisional partitions in office buildings and shop fit-out in retail spaces, site infrastructure work, diversion of existing services, resident site staff cost, models and prototypes, future cost escalation, show flats / sales office, Green Mark Cost Premiums and Goods & Services Tax. All prices stated below include a general allowance for foundation, car park and external works.

Development Type	Building Works	Building Services	Total
Range Of Cost Per Construction Floor Area (CFA)	**S$/m²**	**S$/m²**	**S$/m²**
OFFICE			
Standard (outside CBD)	1,850 - 3,150	800 - 1,100	2,650 - 4,250
Standard (within CBD)	1,890 - 3,180	860 - 1,220	2,750 - 4,400
Prestige (within CBD)	2,970 - 3,970	980 - 1,530	3,950 - 5,500
HOTEL (including FF&E)			
Serviced Apartment	2,940 - 3,260	1,110 - 1,490	4,050 - 4,750
Three Star	3,130 - 3,640	1,020 - 1,410	4,150 - 5,050
Four Star	3,840 - 4,600	1,110 - 1,550	4,950 - 6,150
Five Star	4,530 - 5,390	1,370 - 1,910	5,900 - 7,300
RETAIL			
Medium Quality	1,780 - 2,700	970 - 1,250	2,750 - 3,950
Good Quality	2,740 - 2,980	1,210 - 1,470	3,950 - 4,450
CONDOMINIUM			
Medium Quality	2,510 - 2,750	440 - 600	2,950 - 3,350
Good Quality	2,880 - 3,540	470 - 710	3,350 - 4,250
Luxury Quality	3,730 - 5,020	520 - 830	4,250 - 5,850
LANDED RESIDENTIAL			
Cluster Housing	2,950 - 3,610	400 - 540	3,350 - 4,150
Terrace House	2,660 - 3,100	540 - 650	3,200 - 3,750
Semi-detached House	2,770 - 3,780	580 - 770	3,350 - 4,550
Detached House	3,960 - 6,710	790 - 1,090	4,750 - 7,800
INSTITUTIONAL			
Institution of Higher Learning	2,990 - 3,690	860 - 1,160	3,850 - 4,850
Medical Institution	4,350 - 5,820	1,000 - 1,430	5,350 - 7,250
INDUSTRIAL			
Single Storey Warehouse	1,330 - 1,890	220 - 310	1,550 - 2,200
Light Industrial Building	1,200 - 1,540	400 - 710	1,600 - 2,250
Heavy Industrial Building	1,540 - 2,010	410 - 640	1,950 - 2,650
HEALTHCARE			
Nursing Home	1,700 - 3,240	650 - 960	2,350 - 4,200
Medical Centre	2,910 - 3,150	940 - 1,250	3.850 - 4,400
Hospital	3,680 - 3,950	1,020 - 1,400	4,700 - 5,350
CAR PARKING			
Above Grade Car Park	840 - 1,510	110 - 190	950 - 1,700
Basement Car Park	1,720 - 2,570	280 - 380	2,000 - 2,950

SINGAPORE CONSTRUCTION COST DATA

CONSTRUCTION ELEMENTS

The following rates are indicative only as at 4th Quarter 2022, unless otherwise stated and include an allowance for profit and overheads but exclude preliminaries.

The rates are for budgetary purposes and are not valid for tendering or pricing of variations.

Item	S$	Unit
SUB-STRUCTURE		
Reinforced concrete pad footing (Grade 35)	620 - 700	m^3
300mm Reinforced concrete slab on ground (Grade 35)	140 - 180	m^2
COLUMNS / WALLS		
Reinforced concrete (600 x 600mm Grade 35)	470 - 600	m
Reinforced concrete (900 x 900mm Grade 35)	940 - 1,190	m
250mm Reinforced concrete wall (Grade 35)	290 - 310	m^2
UPPER FLOORS (Excluding Beams)		
150mm Reinforced concrete suspended floor slab (Grade 35)	150 - 160	m^2
120mm Concrete slab on Bondek with structural steel supports and 2-hour fire spray (excluding structural steel beam)	210 - 250	m^2
STAIRCASES		
1050mm Wide reinforced concrete stairs with painted steel tube balustrade (average rise 3.70m)	7,200 - 10,900	flight
2000mm Wide grand public stairs with glass and brass balustrade (4.00m rise)	81,100 - 117,600	flight
ROOF		
120mm RC Slab (Grade 35) graded to fall and built-up roofing membrane	200 - 240	m^2
Structural steel, purlins and insulated metal deck roof	470 - 560	m^2
EXTERNAL WALLS		
Single glazed window unit (casement type)	450 - 650	m^2
Double glazed window unit (casement type)	640 - 860	m^2
Unitised double glazed curtain wall system	880 - 1,150	m^2
EXTERNAL DOORS (Excluding Ironmongery)		
Single leaf solid core timber door	800 - 1,370	no.
Double leaf glazed glass door	2,100 - 3,680	no.
Double leaf auto operating glass door	5,000 - 7,500	no.

Item	S$	Unit
INTERNAL WALLS		
Stud plasterboard partition	80 - 140	m^2
100mm Precast non load bearing wall	90 - 120	m^2
150mm Precast load bearing wall	320 - 360	m^2
12mm Laminated glass screen	380 - 460	m^2
INTERNAL DOORS (Excluding Ironmongery)		
Single leaf solid core flush timber door	710 - 1,090	no.
Single leaf half hour fire timber door	860 - 1,600	no.
Single leaf one hour fire timber door	1,220 - 1,830	no.
INTERIOR SCREENS		
Laminated toilet partition	660 - 1,200	no.
WALL FINISHES		
Cement and sand plaster and emulsion paint	30 - 50	m^2
Cement render and vinyl fabric	70 - 90	m^2
Cement render and ceramic tile	110 - 130	m^2
Marble wall finish on rendered backing	270 - 370	m^2
Marble wall cladding	330 - 430	m^2
CEILING FINISHES		
Fibrous flush plasterboard ceiling painted	40 - 50	m^2
One way exposed grid with mineral fibre board acoustic ceiling	30 - 40	m^2
Aluminium louvre ceiling system	100 - 170	m^2
FLOOR FINISHES		
Carpet tile	70 - 90	m^2
Ceramic / homogeneous tile	100 - 120	m^2
Granite tile	170 - 350	m^2
Access floors	90 - 200	m^2
SPECIALIST SERVICES		
SANITARY AND PLUMBING		
Average cost per plumbing point including fixture, soil waste and vent	1,270 - 1,650	no.
VERTICAL TRANSPORTATION		
Glass sided escala tor (4m rise)	150,000 – 250,000	no.
17 Passenger lift serving 17 floors	220,000 – 300,000	no.
Machine-room-less lift serving 2 floors	78,500 – 100,000	no.

EXTERNAL WORKS

External Works	S$	per
LANDSCAPING		
Dense landscaping around buildings including shrubs, plants, topsoil etc.	100 – 170	m^2
Turfing only to large areas including topsoil, sowing and treating	30 – 40	m^2
Vertical Greening: Vine screen comprising stainless steel cables with plant climbers	310 – 550	m^2
CAR PARKS – ON GROUND		
Based on 35m^2 overall area per car lot with premix paving including road lines, channels, drainage and kerbs	4,600 - 5,600	lot
ROADS (Premix finish including kerbs, channels and drainage)		
Residential estate, 6.80m wide excluding foot-paths and nature strips	1,150 - 1,620	m
Industrial estate 10.40m wide including minimal to extensive formation	1,800 - 2,510	m

SPORTS FACILITIES

Facility	S$	per
FOOTBALL FIELD		
Size: 100m x 65m	520,000 – 960,000	field
SWIMMING POOL		
Half-Olympic Size	550,000 – 750,000	pool
Olympic Size	1,200,000 – 1,500,000	pool
TENNIS COURT		
Size: 37m x 18m	110,000 – 140,000	court
BASKETBALL COURT		
Size: 30m x 19m	70,000 – 120,000	court
GOLF COURSE		
18 holes over 60 hectares	1,000,000 - 1,250,000	hole

Air-Conditioning and Mechanical Ventilation (ACMV)
ACMV works include chiller plant, cooling towers, chilled water and condenser water pumps and pipework, air-handling unit systems, fan coil systems, AC ductwork, diffusers, split type air-conditioning units and ductwork, MV fan system, MV ductwork, diffusers and accessories, AC electrical and automatic control works where appropriate.

Sanitary & Plumbing
Sanitary & Plumbing works include water tanks and pumps, hot/cold water distribution piping, installation of water piping to sanitary wares and fittings, installation of waste piping to sanitary wares, aboveground and underground drainage piping system where appropriate.

Fire Protection System
Fire Protection System includes sprinklers, external fire hydrants, hose reels, wet and dry risers, automatic fire alarms and fire extinguishers where appropriate.

Electrical Installations
Electrical Installations include power transformers, sub-station, HV & LV switchgear, distribution/sub-main cables, final sub-circuits, cable support systems and containments, lightning protection system, earthing system, luminaires and lighting control system, standby generators, telecommunication system, public address system, intercom system, MATV/CATV system where appropriate.

Vertical Transportation
Vertical Transportation includes lifts, escalators, travellators, dumbwaiters, etc., where appropriate.

Building Management Systems (BMS)
BMS include Control and Monitoring Systems where appropriate.

Exclusions
Security Systems, IT systems, private telephone system, audio video system, car parking system, compactors, chutes; special equipment such as proprietary systems, medical gases, incinerators, pneumatic refuse disposal system, facade maintenance equipment, engineered smoke control systems, hardened structure requirements, supply of kitchen equipment, sanitary wares and fittings, Green Mark certification, WELL building standard® and other sustainability related certification requirements, etc.

Note:
The order of costs for Building Services provided herein is indicative and based solely on Construction Floor Area (CFA) assumptions.
Detailed requirements and specifications for Building Services need to be considered and provided in conceptual designs to derive cost estimates for specific project budgetary purposes.

SINGAPORE CONSTRUCTION COST DATA

BUILDING SERVICES

Development Type	ACMV	Sanitary & Plumbing	Fire Protection	Electrical	Vertical Transport	BMS
Range of Cost per Construction Floor Area (CFA)	**S$/m²**	**S$/m²**	**S$/m²**	**S$/m²**	**S$/m²**	**S$/m²**
OFFICE						
Standard (outside CBD)	260 - 350	60 - 100	60 - 100	310 - 400	90 - 120	20 - 30
Standard (within CBD)	290 - 400	60 - 110	70 - 120	310 - 410	100 - 150	30 - 30
Prestige (within CBD)	340 - 460	70 - 140	90 - 130	340 - 530	110 - 230	30 - 40
HOTEL (including FF&E)						
Serviced Apartment	330 - 420	230 - 280	80 - 130	360 - 500	90 - 130	20 - 30
Three Star	290 - 410	210 - 260	80 - 130	340 - 450	80 - 130	20 - 30
Four Star	320 - 430	240 - 320	80 - 140	350 - 470	100 - 150	20 - 40
Five Star	380 - 510	260 - 340	120 - 170	470 - 650	110 - 200	30 - 40
RETAIL						
Medium Quality	300 - 390	110 - 140	90 - 110	320 - 410	130 - 170	20 - 30
Good Quality	390 - 470	140 - 150	100 - 120	410 - 500	150 - 190	20 - 40
CONDOMINUM						
Medium Quality	140 - 180	80 - 110	20 - 40	160 - 210	40 - 60	0 - 0
Good Quality	150 - 210	90 - 130	20 - 60	170 - 230	40 - 80	0 - 0
Luxury Quality	150 - 220	100 - 140	30 - 70	190 - 250	50 - 130	0 - 20
LANDED RESIDENTIAL						
Cluster Housing	100 - 140	140 - 180	10 - 20	150 - 200	0 - 0	0 - 0
Terrace House	190 - 220	140 - 180	0 - 0	210 - 250	0 - 0	0 - 0
Semi-detached House	200 - 260	140 - 190	0 - 0	240 - 320	0 - 0	0 - 0
Detached House	260 - 370	180 - 250	0 - 0	350 - 470	0 - 0	0 - 0
INSTITUTIONAL						
Institution of Higher Learning	270 - 360	110 - 160	100 - 120	290 - 400	70 - 80	20 - 40
Medical Institution	300 - 420	200 - 290	70 - 110	340 - 470	70 - 100	20 - 40
INDUSTRIAL						
Single Storey Warehouse	70 - 100	20 - 30	20 - 40	110 - 140	0 - 0	0 - 0
Light Industrial Building	120 - 220	50 - 100	40 - 70	130 - 200	60 - 100	0 - 20
Heavy Industrial Building	120 - 150	40 - 70	40 - 80	130 - 220	80 - 100	0 - 20
HEALTHCARE						
Nursing Home	230 - 310	150 - 210	20 - 70	250 - 330	0 - 40	0 - 0
Medical Centre	300 - 390	130 - 190	90 - 110	320 - 410	90 - 120	10 - 30
Hospital	320 - 410	200 - 280	80 - 110	340 - 460	60 - 100	20 - 40
CAR PARKING						
Above Grade Car Park	30 - 40	10 - 20	20 - 30	50 - 70	0 - 30	0 - 0
Basement Car Park	100 - 120	40 - 40	60 - 80	80 - 110	0 - 30	0 - 0

OFFICE FIT-OUT

The following costs that include workstations are an indication of those currently achievable for good quality office accommodation.

Type Of Tenancy	Open Planned S$/m²	Partitioned S$/m²
General Offices	580 – 1,210	1,090 – 1,610
Major Company Headquarters	1,040 – 1,730	1,270 – 2,420
Financial Institution	1,270 – 2,300	2,070 – 3,220

WORKSTATIONS

3,500mm average length including screens generally 1,220mm high (managerial 1,620mm high), desks, storage cupboards, shelving etc. Supply of chairs is excluded.

Type of Workstation	S$/Station
Secretarial	1,200 – 1,800
Technical Staff	1,400 – 2,200
Managerial	2,900 – 4,300

OFFICE REFURBISHMENT

The following refurbishment costs include demolition and removal of partitions and internal finishes, provide new floor, ceiling and wall finishes but exclude fitting-out. The lower end of the range indicates reuse and modification.

Type of Refurbishment	S$/m²
CBD offices typical floor	920 – 1,960
CBD offices core upgrade (excluding lift modernisation)	700 – 1,730

HOTEL GUESTROOM FIT-OUT AND FF&E

The costs of furniture, fitments and equipment (FF&E) for a typical hotel guest room varies within its wide range and is largely dependent on the quality of FF&E specified for different hotel ratings. Fit-out costs include preliminaries, wall, floor and ceiling finishes. FF&E costs include fitments, sanitary wares and bathroom accessories, mirrors, curtains, blinds, decorative lighting, and loose furniture. Hotel equipment and operating supplies are excluded.

Type of Hotel	S$/Guest Room
Three-Star	20,000 – 36,000
Four-Star	39,000 – 52,000
Five-Star	53,000 – 77,000

Marina Bay Sands, Singapore

ESTIMATING DATA

REINFORCEMENT RATIOS

The following ratios give an indication of the average weight of high tensile rod reinforcement per cubic metre of concrete (Grade 40) for the listed elements. Differing structural systems, ground conditions, height of buildings, load calculations and sizes of individual elements and grid sizes will result in considerable variation to the stated ratios. For project specific ratios, a Civil & Structural Engineer should be consulted.

Element	Average kg/m³
Pile caps	115 – 180
Bored Piles (compression)	25 – 35
Bored Piles (tension)	100 – 150
Raft Foundation	150 – 220
RC pad footings	70 – 100
Ground beams	200 – 300
BASEMENT	
Retaining Wall	150 – 250
RC Wall	140 – 180
Slab	100 – 150
Edge Beams	220 – 300
ABOVE GROUND	
Columns	250 – 380
Beams	220 – 350
Slab	110 – 150
Core Walls / Lift Walls	160 – 280
Household Shelter	250 – 350
Stairs	130 – 160

AVERAGE CONSTRUCTION PAYMENT DRAWDOWN

The tabulation below is derived from the statistical average of a series of case histories, which will give an indication of the anticipated rate of expenditure when used for a specific project for preliminary budgetary purposes. Construction periods incorporate various extensions of time, including wet weather, industrial disputes, etc.

All data is related to the date of submission of Contractors' claims to the Client and not actual payment, which is generally one month later.

No adjustment has been made for the retention monies for private sector projects.

The payment of outstanding monies due to the contractor and sub-contractors after the date of practical completion usually takes place at irregular intervals with payments spread out over defects liability period until settlement of final account and issuance of maintenance certificate or equivalent.

Contract Period %	Contract Expenditure %
5	0.75
10	2.70
15	5.71
20	9.65
25	14.40
30	19.80
35	25.73
40	32.06
45	38.65
50	45.40
55	52.85
60	60.15
65	67.15
70	73.68
75	79.60
80	84.79
85	89.07
90	92.29
95	94.32
100	97.50

ESTIMATING DATA

VERTICAL TRANSPORT SERVICES

Application	Lift Type
Office & Residential	Gearless 9 to 13 pax
	Gearless 9 to 13 pax
	Gearless up to 17 pax
	Gearless up to 23 pax
	Gearless up to 23 pax
	Gearless up to 23 pax
	Gearless up to 23 pax
	Gearless up to 23 pax
	Gearless up to 23 pax
	Gearless up to 23 pax
Hospital	Gearless 23 pax bed lift
	Geared up to 40 pax
Large Goods Lift	Geared up to 2,000kg
	Geared up to 5,000kg
Service Lift (Dumb-Waiter)	Bench Height Unit
	Large Unit
Escalator	Rise 2.5 to 5.0m
Travelator	Distance 1.3 to 5.0m
Disabled Platform Lift	To 4.0m
	Above 4.0m

Speed (m/sec)	Base Cost (S$)	No. of Floors Served	S$/Floor Additional Floors Served	S$/Floor By-passed
1.00	85,000 - 130,000	2	7,900	5,800
1.65 - 1.75	100,000 - 160,000	8	7,900	5,800
1.65 -1.75	130,000 - 200,000	8	7,900	5,800
2.00 - 2.50	180,000 - 300,000	15	8,400	6,900
3.00 - 3.50	390,000	20	9,500	7,400
4.00	468,000	20	10,500	7,800
5.00	572,000	20	10,500	7,800
6.00	676,000	30	10,500	7,800
7.00	780,000	30	10,500	7,800
8.00	884,000	40	10,500	7,800
1.75	204,800	8	8,400	6,300
2.50	510,000	10	14,700	9,000
1.00	300,000	2	15,300	9,500
0.50	450,000	2	18,900	11,600
0.50	42,000	2	5,300	3,000
0.20	65,100	2	6,300	3,600
0.50	136,500 - 258,000	2	N.A.	N.A.
0.50	78,800 - 310,000	N.A.	N.A.	N.A.
0.15	75,000	2	N.A.	N.A.
0.15	90,000	3	N.A.	N.A.

Note:
Costs provided above are indicative and vary depending on the brand name and technical specifications.

New Science Centre, Singapore

INTERNATIONAL CONSTRUCTION

Refer to www.rlbintelligence.com for updates.

The following data represents estimates of current building costs in the respective markets as at Fourth Quarter 2022 unless otherwise stated.

Costs may vary due to factors such as site conditions, climatic conditions, standards of specification, market conditions, etc.

Rates are in national currency per square metre of Gross Floor Area (GFA), unless otherwise stated in the facing page. Areas referenced differ due to local market metrics. GFA shall be as defined in each city's local context.

Singapore, Kuala Lumpur, Jakarta and Ho Chi Minh City: Rates are per square metre of Construction Floor Area (CFA), measured to external face of external walls and inclusive of covered basement and above ground parking areas.

Chinese cities, Hong Kong and Macau: Rates are per square metre of Construction Floor Area (CFA), measured to outer face of external walls.

Singapore, Kuala Lumpur, Chinese cities, Hong Kong and Macau: All hotel rates are inclusive of Furniture, Fittings and Equipment (FF&E).

Location /City	Local Currency	Cost Range Per m²			
		Office Building			
		Premium		Grade A	
		Low	High	Low	High
ASIA					
Beijing	RMB	9,400	15,250	8,750	13,250
Guangzhou	RMB	8,250	13,200	7,600	11,500
Ho Chi Minh City	VND ('000)	27,575	36,475	24,225	28,700
Hong Kong	HKD	25,000	36,100	21,300	27,500
Jakarta	RP ('000)	13,600	19,400	9,400	13,000
Kuala Lumpur	MYR	2,700	4,700	1,500	3,400
Seoul	KRW ('000)	3,000	3,880	2,270	2,790
Shanghai	RMB	8,400	13,400	7,500	11,650
Singapore	SGD	3,650	6,300	2,550	4,950
OCEANIA					
Adelaide	AUD	3,050	4,200	2,550	3,500
Auckland	NZD	4,500	5,500	3,800	5,300
Brisbane	AUD	3,500	5,000	3,000	4,300
Canberra	AUD	3,750	6,000	3,050	4,650
Christchurch	NZD	4,000	5,200	3,200	4,800
Darwin	AUD	3,500	4,400	2,550	4,000
Gold Coast	AUD	2,800	4,400	2,250	3,400
Melbourne	AUD	3,750	4,950	2,900	3,950
Perth	AUD	3,900	6,100	3,200	4,800
Sydney	AUD	4,400	6,700	3,350	4,900
Wellington	NZD	4,700	5,600	3,400	4,800
AMERICAS @ Q2 2022					
Boston	USD	3,765	5,920	2,420	3,500
Chicago	USD	3,230	5,380	1,940	3,230
Denver	USD	3,390	4,790	1,940	2,635
Honolulu	USD	3,605	6,135	2,260	3,550
Las Vegas	USD	2,155	3,765	1,455	2,045
Los Angeles	USD	2,635	3,985	1,990	2,960
New York	USD	3,930	9,095	2,315	5,705
Phoenix	USD	2,370	4,035	1,505	2,155
Toronto	CAD	2,905	4,735	2,370	3,335

N/P: Not Published

Cost Range Per m²					
Retail				Residential Multi Storey	
Mall		Strip Shopping			
Low	High	Low	High	Low	High
10,300	15,650	9,000	14,100	4,900	10,100
9,450	13,350	8,100	12,250	4,400	8,600
22,475	29,950	N/P	N/P	16,750	27,275
24,700	30,900	20,900	27,100	23,100	46,100
7,100	9,600	N/P	N/P	7,400	17,000
2,400	3,800	N/P	N/P	2,000	4,800
2,020	2,950	1,710	2,590	1,940	3,260
8,800	14,050	7,750	12,750	4,150	8,400
2,400	4,050	N/P	N/P	2,650	4,150
1,820	3,300	1,440	2,050	2,600	3,950
3,350	3,700	2,000	2,400	4,300	5,500
3,000	4,500	2,000	2,500	3,300	5,000
2,600	4,400	1,360	2,800	3,200	5,700
2,900	3,200	1,660	2,100	3,750	4,500
1,900	2,850	1,440	2,350	2,200	2,800
2,500	3,500	1,200	1,800	1,960	4,500
2,550	3,700	1,440	1,920	2,900	5,000
2,400	3,700	1,300	3,300	2,400	5,400
2,450	5,300	1,860	2,550	3,250	7,200
3,300	3,500	N/P	N/P	4,350	5,300
2,155	3,230	1,615	2,585	1,990	3,390
1,990	4,305	1,615	2,690	1,940	4,520
1,560	2,530	1,455	2,475	1,990	3,500
2,800	5,920	2,585	4,415	2,850	4,790
1,290	5,165	1,130	2,045	1,615	3,820
1,775	3,875	1,505	2,155	2,585	4,090
3,390	6,780	3,605	7,105	2,420	4,575
1,885	3,175	1,075	1,830	1,670	2,635
2,155	4,575	1,720	2,260	2,370	3,120

N/P: Not Published

INTERNATIONAL CONSTRUCTION

BUILDING COSTS (Continued from page 30)

Location /City	Local Currency	Cost Range Per m²			
		Office Building			
		Premium		Grade A	
		Low	High	Low	High
EUROPE					
Amsterdam	EUR	1,400	2,000	1,160	1,560
Birmingham	GBP	2,400	3,400	1,860	3,300
Bristol	GBP	2,300	3,250	1,840	3,250
Edinburgh	GBP	1,920	2,700	1,680	2,700
London	GBP	3,200	4,150	2,850	3,950
Manchester	GBP	2,650	3,350	2,200	3,350
Moscow	EUR	1,360	1,860	1,200	1,460
Oslo	EUR	2,450	3,000	1,800	2,150
MIDDLE EAST @ Q2 2022					
Abu Dhabi	AED	6,000	7,200	4,900	6,800
Dubai	AED	6,400	7,600	5,100	7,200
Riyadh	SAR	1,300	8,800	5,700	7,900

Cost Range Per m²					
Retail				Residential Multi Storey	
Mall		Strip Shopping			
Low	High	Low	High	Low	High
1,540	2,200	1,000	1,540	1,160	1,860
3,500	4,950	1,100	2,150	1,980	2,800
3,200	4,450	1,000	1,900	1,480	2,150
2,950	4,150	940	1,760	1,760	2,500
3,850	5,400	1,240	2,300	2,700	4,750
3,650	5,100	1,160	2,200	2,150	3,100
1,100	1,800	1,060	1,300	650	1,200
2,100	2,700	1,800	2,150	1,880	1,780
4,300	6,700	N/P	N/P	4,700	6,900
4,500	7,100	N/P	N/P	4,900	7,300
3,500	6,500	3,800	5,500	3,400	14,750

Location /City	Local Currency	Cost Range Per m²			
		Hotels			
		3 Star		5 Star	
		Low	High	Low	High
ASIA					
Beijing	RMB	11,800	15,200	15,850	21,000
Guangzhou	RMB	11,000	13,500	14,900	19,300
Ho Chi Minh City	VND ('000)	28,225	36,475	40,150	48,175
Hong Kong	HKD	31,200	35,900	37,200	45,400
Jakarta	RP ('000)	16,600	20,000	23,600	27,000
Kuala Lumpur	MYR	2,700	3,900	5,500	8,500
Seoul	KRW ('000)	2,220	3,080	4,060	6,020
Shanghai	RMB	10,650	13,800	14,500	19,200
Singapore	SGD	3,950	4,650	5,700	7,300
OCEANIA					
Adelaide	AUD	3,500	4,000	5,200	5,700
Auckland	NZD	5,000	6,000	6,800	7,500
Brisbane	AUD	3,600	5,000	5,000	6,500
Canberra	AUD	3,350	5,800	4,600	6,900
Christchurch	NZD	4,700	5,100	5,600	6,800
Darwin	AUD	3,000	3,750	3,800	4,750
Gold Coast	AUD	2,800	4,000	4,000	5,600
Melbourne	AUD	3,400	4,350	4,750	6,500
Perth	AUD	3,300	4,600	4,400	6,000
Sydney	AUD	3,950	5,100	5,500	7,600
Wellington	NZD	4,600	5,100	5,700	7,500
AMERICAS @ Q2 2022					
Boston	USD	2,960	4,200	4,305	6,245
Chicago	USD	3,445	4,845	4,845	7,535
Denver	USD	3,070	4,465	3,930	6,190
Honolulu	USD	3,985	6,350	6,945	8,450
Las Vegas	USD	1,990	3,390	3,335	6,245
Los Angeles	USD	3,175	4,035	4,200	6,190
New York	USD	3,605	4,900	4,900	7,320
Phoenix	USD	1,990	2,960	3,765	5,920
Toronto	CAD	2,475	3,015	4,200	7,695

N/P: Not Published

Cost Range Per m²					
Car Parking				Industrial Warehouse	
Multi Storey		Basement			
Low	High	Low	High	Low	High
2,750	3,750	4,600	7,900	5,250	6,700
2,400	3,440	4,290	7,350	4,800	5,900
16,550	24,100	N/P	N/P	N/P	N/P
10,800	13,800	23,200	31,500	16,300	20,500
4,100	5,100	6,500	8,600	5,200	6,400
800	1,300	1,400	3,600	1,100	1,900
840	1,060	1,090	1,400	1,530	1,890
2,400	3,450	4,400	7,450	4,450	5,850
880	1,420	1,840	2,700	1,520	2,200
760	1,080	1,500	2,200	720	1,220
1,360	2,000	2,800	3,200	1,000	1,360
1,300	1,800	1,900	2,500	1,000	1,600
850	1,420	1,160	1,980	800	1,500
1,200	1,660	2,300	2,500	900	1,300
840	1,440	1,380	1,760	900	1,640
900	1,400	1,600	2,200	750	1,200
930	1,480	1,480	2,050	760	1,420
840	1,300	2,300	3,900	720	1,300
940	1,500	1,380	2,350	910	1,500
1,600	1,840	3,200	3,400	1,140	1,560
915	1,505	1,075	1,720	1,185	2,045
860	1,400	1,505	2,690	1,290	2,155
1,560	2,155	2,155	2,690	1,130	2,100
1,615	2,155	1,775	2,905	1,290	2,690
540	915	755	1,560	755	1,075
1,185	1,400	1,505	2,155	1,400	2,100
1,075	1,990	1,505	2,420	1,290	2,315
540	970	860	1,455	805	1,345
1,185	1,505	1,455	2,155	1,290	1,775

N/P: Not Published

INTERNATIONAL CONSTRUCTION

BUILDING COSTS (Continued from page 32)

Location /City	Local Currency	Cost Range Per m²			
		Hotels			
		3 Star		5 Star	
		Low	High	Low	High
EUROPE					
Amsterdam	EUR	1,340	1,700	1,920	2,850
Birmingham	GBP	1,600	2,550	2,700	3,850
Bristol	GBP	1,540	2,050	2,650	3,550
Edinburgh	GBP	1,420	2,100	2,250	3,100
London	GBP	2,050	2,600	3,050	4,050
Manchester	GBP	1,860	2,350	2,800	3,800
Moscow	EUR	1,600	2,000	2,300	2,950
Oslo	EUR	2,850	3,100	3,150	3,800
MIDDLE EAST @ Q2 2022					
Abu Dhabi	AED	6,300	8,800	9,300	12,500
Dubai	AED	6,600	9,800	9,800	15,500
Riyadh	SAR	6,800	8,700	18,250	21,750

N/P: Not Published

Cost Range Per m²					
Car Parking				Industrial Warehouse	
Multi Storey		Basement			
Low	High	Low	High	Low	High
430	650	800	1,240	460	820
440	860	1,000	1,740	610	880
470	920	1,100	1,720	470	740
370	710	890	1,520	400	710
490	980	1,300	2,150	540	970
690	860	1,300	1,860	610	860
440	560	810	1,020	500	700
480	550	980	1,080	1,260	1,540
1,900	3,700	3,000	4,700	1,600	2,800
2,600	3,900	3,400	4,900	2,000	3,200
2,600	3,300	3,500	4,150	3,800	4,650

N/P: Not Published

SPECIFIC DEFINITIONS FOR INTERNATIONAL CONSTRUCTION COSTS

Office Buildings

Prestige/ Premium Offices are based on landmark office buildings located in major CBD Office Markets, which are built for the premium range of the rental market. These office buildings tend to be pace-setters in establishing rentals and accommodates leading owner-occupiers including headquarters for banks, insurance, multi-national corporations and other major companies.

Grade-A/ Investment Offices are based on high quality buildings which are built for the middle to high range of the rental market.

Hotels

Range of costs generally excludes furniture, fitment and equipment (FF&E), except for Chinese cities, Hong Kong, Kuala Lumpur, Macau and Singapore, where the cost ranges stated include cost allowances for FF&E.

Industrial Buildings

Quality reflects a simplified type of construction suitable for light industry.

Exclusions: Hardstanding, roadworks and special equipment.

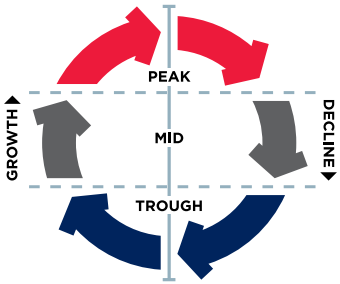
Residential Buildings

Multi-Storey reflects medium to luxury quality and air-conditioned accommodation.

Note: The comparative ratio of kitchen, laundry and bathroom areas to living areas considerably affects the cost range. Range given is significantly affected by the height and configuration of the building.

Exclusions: Loose furniture, special fittings, washing machines, dryers, refrigerators and tenants' special requirements.

CONSTRUCTION MARKET ACTIVITY CYCLE



The RLB Construction Sector Activity Cycle represents the construction development activity cycle. Each RLB office highlights the current construction sector activity position within the market activity cycle of those key construction sectors within their region.

Activity within the construction industry traditionally is subject to volatile cyclical fluctuations. The model illustrates the different growth and decline zones in a theoretical construction industry business cycle. Each RLB office highlights the current construction sector activity position within the market activity cycle of those key construction sectors in their region.

Each sector is categorised by three positions within the cycle; Peak, Mid and Trough. Within each position, activity is further defined by either declining or growing inside that sector. The "up" and "down" arrows highlight the current status within the three positions of the cycle by means of the three colours identified in the cycle diagram above.

The tabulation on the following page provides an overview of the relative growth / decline of each development sector in selected Asian cities. Each city has its own industry business cycle in the context of its own economy, and as such the performance of each development sector is not strictly comparable between the cities.

INTERNATIONAL CONSTRUCTION

CONSTRUCTION MARKET ACTIVITY FOR MAJOR ASIAN CITIES

Location	Houses	Apartments	Offices	Industrial	Retail	Hotel	Civil
Beijing	▼	▼	▲	▼	▼	▼	▲
Chengdu	▼	▼	▼	▼	▼	▼	▼
Guangzhou	▼	▼	▼	▲	▼	▼	▲
Ho Chi Minh City	▲	▲	▲	▼	▲	▲	▲
Hong Kong	▲	▲	▲	▲	▼	▼	▲
Jakarta	▲	▲	▼	▲	▲	▲	▲
Kuala Lumpur	▲	▲	▼	▼	▼	▲	▲
Macau	▼	▲	▲	▼	▼	▼	▲
Seoul	▲	▲	▼	▲	▼	▼	▼
Shanghai	▼	▼	▼	▼	▼	▼	▲
Shenzhen	▼	▲	▼	▲	▼	▼	▲
Singapore	▲	▲	▲	▲	▼	▲	▲

Information as at 4th Quarter 2022.

Woodlands Health Campus, Singapore

SINGAPORE CONSTRUCTION REGULATIONS & INFORMATION

The main objective of building control is to ensure building works comply with standards for safety, accessibility, environmental sustainability and buildability as prescribed in the Building Control Act and Building Control Regulations.

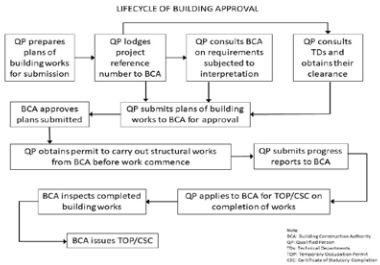
All building works, except those that are minor and exempted under the First Schedule of the Building Control Regulations, will require building plan approval from the Commissioner of Building Control (CBC), Building and Construction Authority (BCA).

Building works refer to:
a. Erection, extension or demolition of a building;
b. Alteration, addition or repair of a building;
c. Provision, extension or alteration of any air-conditioning service or ventilating system in or in connection with a building

and it includes site formation works connected with or carried out for the purpose of (a), (b) or (c).

As stipulated by the Building Control Act, building plans are to be submitted by a Qualified Person (QP). A QP is a person who is registered as an Architect with the Board of Architects or a Professional Engineer (PE) with the Professional Engineers Board. The appropriate QPs for the different types of building works are listed in Third Schedule of the Building Control Regulations. For example, building plans for a warehouse or factory may be submitted by an Architect or a PE, but plans for a retaining wall has to be submitted by a PE.

The typical process of getting building plan approval is illustrated in the following flow chart. (This is a typical process. Variations do exist.)



The design and construction of a building must comply to performance requirements prescribed in the Building Control Regulations.

Source: BCA as at Feb 2023

The Licensing of Builders Scheme is part of BCA's long term plan to upgrade the safety and quality standards of the construction sector while raising professionalism by requiring minimum standards of management, safety record and financial solvency.

All builders carrying out building works where plans are required to be approved by the Commissioner of Building Control and builders who work in specialist areas which have a high impact on public safety will require a Builder's Licence. The requirement applies to both public and private projects.

Type of Licence

License Type	Sub-Type	Allowable Projects
General Builder License	Class 1	Projects of any value
	Class 2	Projects of S$6 million or less
Specialist Builder License	N.A.	Any of the following specialist building works: • Piling works • Ground support and stabilisation works • Site investigation work • Structural steelwork • Pre-cast concrete work • In-situ post-tensioning work Note: Builders may register in more than one category if qualified.

LICENSING OF BUILDERS
(Continued from page 42)

Licensing Requirements

The following requirements must be fulfilled to receive a Builder's License.

Requirement	Details
Appoint an Approved Person (AP)	The AP appointed will take charge and direct the management of the business in building works. The AP must be: • The sole proprietor in a sole proprietorship • One of the partners in a partnership • A director, member of the board of management or an employee (being a person with similar duties and responsibilities of the aforementioned roles) in a corporation The AP must also possess the right qualifications and experience.
Appoint a Technical Controller (TC)	The TC appointed will oversee the execution and performance of any building works undertaken by the builder. For specialist builders, the TC appointed must possess a civil or structural engineering degree from a recognised institution and have the right qualifications and experience. Resident Engineers must meet acceptable qualifications set by BCA.
Meet minimum paid-up capital (for corporations only)	• Class 1 General Builder: not less than S$300,000.00 • Class 2 General Builder or Specialist Builder: not less than S$25,000.00
Pay licensing fees Note: Validity of license is up to 3 years.	• Class 1 General Builder: S$1,800.00 • Class 2 General Builder: S$1,200.00 • Specialist Builder: S$1,500.00

Source: BCA as at Dec 2019

Construction Registration of Tradesmen Scheme (CoreTrade)

CoreTrade requirements on deployment of registered tradesmen and foremen began in 2009. All Class 1 General Builders undertaking a project of value which is S$20 million or more will need to deploy a prescribed minimum number of construction personnel who are registered under the CoreTrade. This applies to new building works, addition and alteration works and civil engineering works. The objective of CoreTrade is to build up a core group of local and experienced foreign workers in key construction trades to anchor and lead the workforce.

Details on registration of CoreTrade personnel, deployment requirements and penalties can be found on BCA website.

Source: BCA as at Mar 2022

BUILDING CONTROL (BUILDABILITY AND PRODUCTIVITY) REGULATIONS 2011

The legislation on buildability has been in effect since 1 January 2001. The Building Control (Buildability and Productivity) Regulations 2011 is an enhanced Buildability framework that came into effect on 15 July 2011. This enhanced legislation tightened the original requirements under the Buildable Design Score (B-Score) and included another component called the Constructability Score (C-Score). The C-Score requires the builders' contributions to buildability through the adoption of more labour-efficient construction methods/ technologies.

While the B-Score focuses on the use of buildable designs by designers during the upstream design process, the C-Score impacts on the construction methods used during the downstream construction phase. Designers and builders should familiarise themselves with the Buildable Design Appraisal System (BDAS) and Constructability Appraisal System (CAS) respectively, to enable them to consider a range of construction systems, methods, technologies, materials and products to meet the scoring requirements.

The types of development which are not subjected to the minimum B-Score and C-Score requirements are:

- Any culvert, bridge, underpass, tunnel, earth retaining or stabilising structure, slipway, dock, wharf or jetty;
- Any theme park;
- Any place of worship;
- Any power station; or
- Any waste processing or treatment plant

Enhancements to Code of Practice (CoP) on Buildability to Accelerate Adoption of Design for Manufacturing and Assembly (DfMA) Technologies

In 2020, the COVID-19 pandemic disrupted the built environment sector and accentuated the urgency for industry transformation through the adoption of technology such as DfMA to reduce our vulnerability to manpower disruptions. DfMA would become the mainstream way to design and construct buildings. It promotes efficient off-site fabrication of building components and eases assembly on-site. This results in a leaner workforce, time savings with works carried out on-site and off-site concurrently, better workmanship quality and reduced disamenities to the public.

The BCA periodically reviews the Buildability framework. In 2019, BCA raised the minimum B-Score to encourage the adoption of DfMA technologies in large residential non-landed (RNL) developments (GFA ≥ 25,000m^2). In December 2020, the Buildability framework was enhanced to:

(a) Revamp the BDAS to integrate DfMA adoption for the Structural, Architectural and Mechanical, Electrical and Plumbing (MEP) disciplines;
(b) Recalibrate new minimum B-Scores for all development types due to revamped BDAS; and
(c) Extend outcome-based option to all large development types, in lieu of meeting the minimum B-Score.

To accelerate the adoption of DfMA for large developments, BCA enhanced the CoP on Buildability and made amendments to the Buildability Regulations as detailed below. The changes apply to projects submitted to URA for Planning Permission on or after 30 April 2022.

Key Changes	Details
(A) Higher minimum B-Scores for large commercial, industrial and institutional projects with GFA ≥ 25,000m^2	To accelerate DfMA adoption for large projects which have greater scope for DfMA application and economies of scale, the minimum B-Scores for superstructure works of large commercial, industrial and institutional projects will be raised. The details are provided in page 49.

BUILDING CONTROL (BUILDABILITY AND PRODUCTIVITY) REGULATIONS 2011 (Continued from page 46)

Key Changes	Details
(B) Enhanced outcome-based options for all large development types, in lieu of meeting the minimum B-Score	Designers have the flexibility to decide on the DfMA designs and technologies that best meet their project needs. Large building projects can opt to comply with Buildability requirements, either by meeting the raised minimum B-Scores or fulfilling one of the outcome-based options. Outcome-based options include deemed-acceptable solutions which are currently applicable to large RNL projects only, while 'open' option is extended to all large projects. In the new COP on Buildability, BCA will make the following enhancements: (i) Revise deemed-acceptable solutions for large RNL projects; (ii) Introduce new deemed-acceptable solutions for large commercial, industrial and institutional projects; and (iii) For the 'open' option, raise the minimum productivity improvement requirement from 20% to 25% (from 2010's level).
(C) Mandatory adoption of specific productive technologies for RNL projects	As modularisation is a key approach to achieve higher productivity and optimise benefits of DfMA, there is scope to steer the sector towards wider adoption of modularised components, especially with standardised dimensions at industry level. This would pave the way for more cost-effective prefabrication of standard components due to greater economies of scale. BCA will require the following industry standard components for RNL projects: (i) Precast Household Shelters: 65% precast (of which 60% are of standard sizes) (ii) Prefabricated Bathroom Units: 65% prefabricated (of which 60% are of standard sizes)
(D) Requirement for PE for Mechanical and Electrical Works to jointly declare B-Score submissions with QP for Architectural and Structural Works	Presently, both the QPs for Architectural and Structural Works are required to declare and submit B-Scores for their projects, together with the building plans for approval. As MEP works also contribute towards raising construction productivity and with the revamped BDAS placing more emphasis on these works, PEs for M&E works now play a bigger role to influence the design of MEP systems. To foster greater collaboration across disciplines during upstream design, BCA would require PEs for M&E works to jointly declare B-Score submissions.

Minimum Buildable Design Score (B-Score)

The minimum B-Score requirements for superstructure and basement works (where applicable) apply to new building works with GFA of 5,000m^2 or more. The minimum B-Score requirements also apply to building works consisting of repairs, alterations and/or additions (A&A work) to an existing building if the building works involve the construction of new floor and/or reconstruction of existing floor for which their total GFA is 5,000m^2 or more. A building design with basement works is required to comply with both the B-Score for superstructure works and the minimum B-Score for basement works.

The minimum B-Score for a mixed development will be prorated according to the GFA of each type of development. Computation of the minimum B-Score for a mixed development can be found in the latest edition of the CoP on Buildability.

BUILDING CONTROL (BUILDABILITY AND PRODUCTIVITY) REGULATIONS 2011 (Continued from page 48)

Minimum Buildable Design Score for Superstructure and A&A Works from 30 April 2022

Category of Building Work / Development	All New Building Works and MRT Stations	
	Superstructure Works	
	5,000m² ≤ GFA < 25,000m²	GFA ≥ 25,000m²
Public Residential (non-landed)	68	80
Private Residential (non-landed)	68	80
Commercial	60	70
Industrial	65	70
Institutional, School and Others	60	66
MRT Station	60	

* Based on date of planning application made to URA.

Basement of All New Building Works, MRT Stations and

All New Building Works and MRT Stations	A&A Works
Basement Works	
GFA ≥ 5,000m²	GFA ≥ 5,000m²
42	42

Submission of Buildable Design Score (B-Score)

The B-Score is one of the requirements for Building Plan (BP) approval. The BP will not be approved if the submitted B-Score for both the superstructure and basement works (where applicable) are lower than the stipulated minimum. The B-Scores are to be submitted by QPs at the following stages:

- BP stage
- ST (Structural plan) basement and superstructure stage
- Temporary Occupation Permit (TOP)/ Certificate of Statutory Completion (CSC) stage

Buildable Design Score (B-Score) Requirements

The B-Score of the superstructure and basement works (where applicable) of a building design shall be determined using the CoP on Buildability and BDAS.

The B-Score of a project is made up of 4 parts:

Part 1 – Structural System. Points are awarded for the use of various types of structural system, DfMA technologies in the structural discipline and structural buildable design features.

Part 2 – Architectural System. Points are awarded for the use of various types of wall system, architectural finishes, DfMA technologies in the architectural discipline and architectural buildable design features.

Part 3 – Mechanical, Electrical and Plumbing (MEP) System. Points are awarded for the use of various types of MEP system, DfMA technologies in the MEP discipline and MEP buildable design features.

Part 4 - Innovation and Others. Points are awarded for the use of new innovation systems and technologies that can achieve manpower savings of at least 20%.

In addition to the above, points are awarded for simple designs that help to ease construction, design modularisation that ease manufacturing, and standardisation and repetition of components under Part 1, 2 and 3.

The maximum B-Score achievable for a project is capped at 120 points. The maximum point weightage for Part 1, 2 and 3 differs depending on the category of a building, as set out in the CoP on Buildability.

Minimum Constructability Score (C-Score)

The minimum C-Score requirement apply to new building works with GFA of 5,000m^2 or more. The minimum C-Score requirements also apply to building works consisting of repairs and A&A works to an existing building if the building works involve the construction of new floor and/or reconstruction of existing floor for which their total GFA is 5,000m^2 or more.

Minimum C-Score for All Building Works comprising Buildings more than 6 Storeys and MRT Stations

Category of Building Work / Development	Minimum C-Score	
	5,000m² ≤ GFA < 25,000m²	GFA ≥ 25,000m²
	w.e.f. 30 April 2022	
Public Residential (non-landed)	50 (min. 35 points from Structural System)	60 (min. 45 points from Structural System)
Private Residential (non-landed)		
Commercial		
Industrial		
Institutional, School and others		
MRT Station		

*The minimum scores above are based on date of planning submissions made to URA including for building works built on land sold under the GLS Programme.

Minimum C-Score for All Building Works comprising Buildings of 6 Storeys and below

Category of Building Work / Development	Minimum C-Score	
	5,000m² ≤ GFA < 25,000m²	GFA ≥ 25,000m²
	w.e.f. 30 April 2022	
Public Residential (non-landed)	50 (min. 32 points from Structural System)	60 (min. 42 points from Structural System)
Private Residential (non-landed)		
Commercial		
Industrial		
Institutional, School and others		

*The minimum scores above are based on date of planning submissions made to URA including for building works built on land sold under the GLS Programme.

Submission of C-Score

Builders are required to submit the C-Scores which shall not be lower than the stipulated minimum at either one of the following stages:

- At the time of application for permit to carry out structural works (Permit), or
- Within 3 months (for non-Design and Build projects) or 6 months (for Design and Build projects) after the permit has been issued in the event that the builder requires more time to plan for the type of construction methods and technologies to be adopted in the project.

C-Score Requirements

The C-Score of the building works shall be determined using the CoP on Buildability and the Constructability Appraisal System (CAS).

The C-Score of a project is made up of 3 parts:

Part A – Structural System (maximum 60 points). Points are awarded for various methods and technologies adopted during the construction of structural works.

Part B – Architectural, Mechanical, Electrical & Plumbing (AMEP) System (maximum 45 points). Points are awarded for various methods and technologies adopted during the construction of AMEP works.

Part C – Good Industry Practices (maximum 15 points). Points are awarded for good industry practices adopted on site to improve productivity.

In addition to the above, points are obtainable in Part A and Part B if a project adopts innovative systems that help to achieve productivity improvement. Innovation points are awarded subjected to BCA's assessment on a case-by-case basis of the impact on labour efficiency of the particular system used.

The total point allocated under the Constructability Assessment Scheme (CAS) is 120 points.

More information on the B-Score and C-Score requirements can be found on the BCA website.

Source: BCA as at Aug 2022

With an ageing population and as the number of people in Singapore with mobility difficulties rise over the years, accessibility in the Built Environment is increasingly gaining importance. The Government introduced the Code on Barrier-Free Accessibility (BFA) to support the upgrading of existing buildings. A S$40-million Accessibility Fund was set aside to encourage private sector participation, to upgrade buildings built before 1990 which are not BFA compliant and upgrade all key areas and essential facilities in Singapore to provide at least basic accessibility by 2016. The Government aims to have 70% of commercial and institutional buildings in Singapore barrier-free by 2030.

BCA also introduced new mandatory requirements in existing buildings from 2017. Owners of commercial and institutional buildings that are visited frequently by the public must include barrier-free accessibility upgrades when they undergo additions and alterations (A&A) works.

The Code on Accessibility in the Built Environment 2019 refines existing requirements to allow more equitable access for elders and persons with disabilities. In the latest revision to the Code, requirements are also enhanced to accommodate the new mobility climate resulting from advancement in technology. Apart from addressing the needs of an ageing population, the revised Code introduces more accessibility and universal design features to improve the built environment for all.

New projects and existing buildings undergoing large-scale A&A have to follow the new Code when they are submitted to BCA for regulatory approval from 6 January 2020.

In March 2020, the Building Control Act was amended, whereby owners of existing non-barrier-free buildings may be required to provide at least basic accessibility features for Persons with Disabilities ("basic accessibility requirement"), if owners carry out A&A works requiring plan approval in any part of the non-barrier-free buildings. The basic accessibility requirement will come into force from 1 June 2023.

The basic accessibility requirement applies to existing non-barrier-free buildings:

- Except those which are used solely for residential purposes or as factories;
- That have GFA of more than 500m^2; and
- That are accessible by the public.

More details on the Code on Accessibility for the Built Environment can be found on the BCA website.

Source: BCA as at Dec 2022

UD in the broadest term is "design for all people". It seeks to create an environment addressing the needs of all age groups and people of different abilities including temporary disability. The move towards universal design has developed due to the expanding population of people with varying degree of abilities and advancing years, their demands for recognition and desire for independent living.

The Universal Design index self-assessment framework (UDi) is a tool introduced in June 2022 as an initiative to raise the bar on UD adoption in developments. The UDi is integrated with Building Plan (BP) and Temporary Occupation Permit (TOP) / Certificate of Statutory Completion (CSC) approval processes and consist of a self-help UDi checklist to

- Enable Qualified Persons (QPs) and developers to learn about and consider user-friendly features that could be provided in their projects; and
- Obtain an indicative measure and rating of the level of user-friendliness for their projects.

All applicable projects which are first applying for BP, TOP or CSC on or after 1 September 2022 are required to complete and submit the UDi checklist as part of their application. A UDi guide was also released that provides explanatory notes and photograph examples to enhance awareness and understanding of the user-friendly features listed in the checklist.

Universal Design Rating

The UD Mark was a voluntary certification scheme launched in October 2012 to promote UD and encouraged the building industry to incorporate the principles in their developments and projects. In July 2015, BCA launched a set of enhanced UD Mark criteria called the UD Mark Version 2.0 (2015), setting higher certification benchmarks and providing an expanded design scope for buildings.

With the introduction of the UDi framework which allows for self-assessment, the BCA UD Mark certification scheme was phased out. Projects which had made reference to the BCA UD Mark certification scheme as a benchmark for the level of user-friendliness can now adopt the UDi framework with its corresponding ratings.

A building/ development which had provided user-friendly features beyond the minimum requirements specified in the Code on Accessibility in the Built Environment would be able to obtain a Universal Design Rating ranging from A to D.

More details on UD can be found on the BCA website.

Source: BCA as at Jun 2022

The BCA Green Mark Scheme was launched in January 2005 as an initiative to drive Singapore's construction industry towards more environment-friendly buildings. It is intended to promote sustainability in the built environment and raise environmental awareness among developers, designers and builders when they start project conceptualisation and design, as well as during construction.

BCA enhanced the Building Control Act and put in place the Building Control (Environmental Sustainability) Regulations 2008 ("ES Regulations 2008") as part of the key initiatives under the earlier Green Building Masterplans.

Under the latest Singapore Green Building Masterplan, more ambitious targets to implement sustainable building development in the Built Environment sector have been set to mitigate the effects of climate change. The Environmental Sustainability requirements in the Code for Environmental Sustainability of Buildings (Edition 4.0) and the Code on Environmental Sustainability Measures for Existing Buildings (Edition 3.0) will focus on building energy efficiency and carbon reduction measures.

The ES Regulations 2008 together with the Building Control (Environmental Sustainability) (Amendment) Regulations 2021 and Building Control (Environmental Sustainability) (Amendment) Regulations 2022 applies to building works where planning permission is first submitted to the URA on or after 1 December 2021:

- Building works which involve a GFA of 5,000m^2 or more
- Building works which involve increasing GFA of an existing building by 5,000m^2 or more;
- Building works relating to an existing building which involve a GFA of 5,000m^2 or more, and which involve the provision, extension or substantial alteration of the building envelope and building services in or in connection with an existing building.

Singapore Green Building Masterplan (SGBMP)

The SGBMP is an action plan that sets out Singapore's environmental sustainability efforts for the Built Environment and is part of the Singapore Green Plan 2030. In the fourth edition, the SGBMP aims to deliver three key targets of "80-80-80 in 2030".

As part of the newest edition, all building criteria, i.e. GM NRB:2015, GM RB:2016 and GM ENRB:2017 are streamlined into a new all-in-one Green Mark 2021 Framework. The BCA GM:2021 came into effect on 1 November 2021.

Mandatory higher Green Mark Standard for Government Land Sales (GLS) Sites

Since 2010, building developments on land sold under the GLS Programme in selected strategic areas are subject to higher Green Mark standards under the Building Control (Environmental Sustainability) Regulations 2008. This helps maximise the potential for cost-effective energy saving solutions in the build environment.

With the increasing need to scale up climate action, more ambitious targets to implement sustainable building development in the BE sector have been set to mitigate the effects of climate change under the latest Singapore Green Building Masterplan. Building developments on land sold under the GLS Programme on or after 30 June 2022 in all areas are required to obtain the BCA Green Mark Platinum (SLE) Rating with Maintainability Badge.

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GreenGov.SG

The public sector is committed to take the lead in environmental sustainability and adopt a long-term view in resource efficiency. Previously known as Public Sector Taking the Lead in Environmental Sustainability (PSTLES), GreenGov.SG strive to attain ambitious sustainability targets in carbon abatement and resource efficiency and be a positive influence and enabler of green efforts.

Regulatory Requirements for Existing Buildings

To achieve an all-round sustainable built environment, it is important to ensure that existing buildings continue to operate efficiently throughout their life cycle.

PartIIIB – Environmental Sustainability Measures for Existing Buildings in the Building Control Act requires owners of existing buildings to:

- Comply with the minimum environmental sustainability standard (Green Mark Standard)
- Submit periodic energy efficiency audits of the building's cooling systems
- Submit information in respect of energy consumption and other related information as required by the Commissioner of Building Control

Minimum Environmental Sustainability Standard for Existing Buildings

On and after 2 January 2017, the Building Control (Environmental Sustainability Measures for Existing Building) Regulations 2016 will apply to all buildings with GFA greater than 5,000m^2, when installing or replacing the building cooling system.

Only the following types of buildings will be excluded from the above requirement:

- Industrial buildings;
- Railway premises, port services and facilities or airport services and facilities;
- Religious buildings;
- Data centres;
- Utility buildings; or
- Residential buildings, excluding serviced apartments.

The minimum environmental sustainability standard of the building shall have a level of environmental performance that meets all relevant Base Requirements and incorporates the number of appropriate sustainability indicators provided under the Carbon Reduction Measures in order to meet the minimum Green Mark score.

Mandatory Submission of Periodic Energy Audits

With effect from 1 January 2014, upon notice from the Commissioner of Building Control, building owners are required to engage a Mechanical Engineer (PE(Mech)) or an Energy Auditor registered with BCA to carry out an energy audit on the building cooling system before making the necessary documentary submission to the Commissioner of Building Control.

The Periodic Energy audit will be applicable to the following group of buildings:

a. For new buildings whose application for planning permission is submitted on or after 1 December 2010, building owners may be issued a notice:
   - At any time after the temporary occupation permit (TOP) or certificate of statutory completion (CSC) is issued; and
   - At intervals of not less than three years after the date of the last notice served.

b. For existing buildings which have undergone a major energy-use change on and after 2 January 2014 and are required to meet the prescribed Green Mark Standard for existing building, building owners may be issued a notice:
   - Three years after the date of the approved as-built score; and
   - At intervals of not less than three years after the date of the last notice served.

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BCA Green Mark Assessment Criteria

BCA Green Mark is a green building rating system to evaluate a building for its environmental impact and performance. It provides a comprehensive framework for assessing the overall environmental performance of new and existing buildings to promote sustainable design, construction and operations practices in buildings.

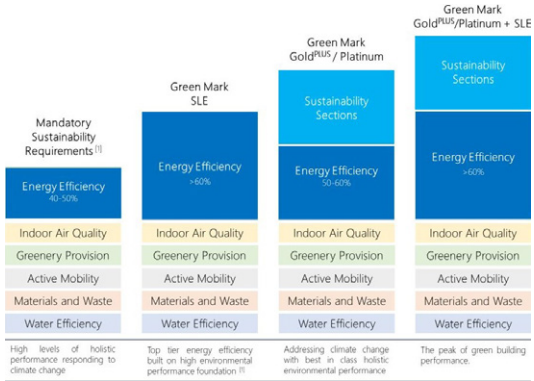
Under the assessment framework for new buildings, developers and design teams are encouraged to design and construct green, sustainable buildings which are more climatic responsive, energy effective, resource efficient, smarter and have healthier indoor environments. As for existing buildings, the building owners and operators are encouraged to meet their sustainable operations goals and to reduce adverse impacts of their buildings on the environment and occupant health over the entire building life cycle. Beside buildings, the assessment criteria evaluate energy efficiency, water efficiency, environment protection, indoor environmental quality and other green/ innovative features of districts, parks, infrastructure and building interiors.

Green Mark 2021

The BCA GM:2001 is an internationally recognised green building certification scheme tailored for the tropical climate. It applies to new and existing buildings, including commercial buildings, industrial buildings, institutional buildings and residential buildings.

BCA Green Mark Award Rating Scores

GM:2021 is positioned to recognise performance that is above mandatory, regulated standards, that include robust levels of energy efficiency, indoor air quality, greenery provision, active mobility considerations, materials and waste management and water efficiency.



[1] Mandatory requirements are based on development control and building plan provisions for new buildings, for existing buildings under retrofit, the requirements would vary depending on the type and extent of the works being undertaken.

Project teams can choose either to follow the Green Mark Gold^{PLUS} or Platinum certification, or Green Mark SLE certification.

GM Series	GM SLE Series
-	SLE, ZE, PE
Gold^{PLUS}	Gold^{PLUS} SLE
Platinum	Platinum SLE

More details on Environmental Sustainability can be found on the BCA website.

Source: BCA as at Jun 2022

Prior to 1989, the intensity of residential development was measured in terms of population density i.e. persons per hectare. For non-residential developments such as industrial and warehouse buildings, institutional buildings, commercial buildings etc., the intensity was measured in terms of plot ratio.

Following the introduction of the new development charge system in 1989, the GFA concept was adopted by URA to determine the development intensity of a building, thereby standardising the previous methods of calculating development intensity for different types of developments.

Definition of Gross Floor Area

All covered floor areas of a building, except otherwise exempted and uncovered areas for commercial uses are deemed the GFA of the building for purposes of plot ratio control and development charge. The GFA is the total area of the covered floor space measured between the centre line of party walls, including the thickness of external walls but excluding voids. Accessibility and usability are not criteria for exclusion from GFA. URA reserves the right to decide on GFA matters based on the specific design of a development proposal on a case-by-case basis.

Various items and areas that are counted, partially counted or not counted as GFA in a building development are indicated in the following tabulation.

Items at a glance on GFA

Items	Excluded From GFA*	Partially excluded as GFA*	Included as GFA	GFA over and above Master Plan Control*
Automated Teller Machine and Vending Machine Kiosk			✓	
Balconies			✓	✓
Basement Diaphragm Wall	✓			
Bay Windows			✓	
Bicycle Parking Space	✓			
Cable Chamber	✓			
Car Parking Lot	✓			
Catwalk	✓			
Communal Roof Terrace	✓			
Covered Communal Ground Gardens		✓		
Covered Enclosed Space			✓	
Covered Greenhouses / Farms			✓	
Covered Swimming Pool			✓	
Covered Water Feature	✓			
Covered Walkway	✓			
Curtain Wall	✓			
Driveways	✓			
End of Trip Facilities	✓			
Entrance Canopy	✓			
Floors – Under a Pitch Roof			✓	
Floors – Under a Platform			✓	
Floors – Intermediate			✓	
Floors – Perforated			✓	
Guardhouse and Sentry Post			✓	

GROSS FLOOR AREA (GFA)
(Continued from page 62)

Items at a glance on GFA

Items	Excluded From GFA*	Partially excluded as GFA*	Included as GFA	GFA over and above Master Plan Control*
Household Shelter			✓	
Indoor Recreation Space			✓	✓
Ledge – Air-Conditioner	✓			
Ledge – Firemen's	✓			
Ledge – Sun Shading Purpose	✓			
Letter Boxes	✓			
Lift Lobbies with Car Park Floor		✓		
Lift Motor Room			✓	
Lift Shaft			✓	
Linkages	✓			
Loading and Unloading Bay	✓			
Loading and Unloading Platforms			✓	
Metal Ceiling Grid	✓			
Meter Compartment	✓			
M&E Space – With Limited Headroom	✓			
M&E Space – Within Basement Car Park Floor	✓			
M&E Space – Enclosed by Chain Link Fence on Car Park Floor	✓			
Motorcycle Parking Lot	✓			
Open Courtyards and Air Wells (Pre-1960)			✓	
Outdoor Refreshment Area			✓	✓
Outdoor Refreshment Kiosk			✓	✓
Pavilions	✓			
Pick-up/ Drop-off Point	✓			
Planter Boxes – Communal	✓			
Planter Boxes – Private			✓	
Private Enclosed Space			✓	✓
Private Roof Terrace			✓	✓
Privately Owned Public Space	✓			
Racking System for Storage Purpose	✓			
Recessed Window			✓	
Refuse Chamber	✓			
Refuse Chute	✓			
Reinforced Concrete Slabs within Voids			✓	
Roof Cover	✓			
Roof Eaves and Building Projections – Below 6th Storey		✓		
Roof Eaves and Building Projections – At and Above 6th Storey	✓			

GROSS FLOOR AREA (GFA)

(Continued from page 64)

Items at a glance on GFA

Items	Excluded From GFA*	Partially excluded as GFA*	Included as GFA	GFA over and above Master Plan Control*
Shadow Area – Elevated Linkway	✓			
Shadow Area - Solar Panel	✓			
Service Duct			✓	
Sky Terrace		✓		
Staircase			✓	
Staircase – Intermediate	✓			
Staircase – Scissors			✓	
Staircase – Connecting Virtual Floors			✓	
Staircase – Uncovered External Perforated Staircase			✓	
Staircase – Uncovered Staircase to ESS	✓			
Unenclosed Facade Articulation			✓	✓
Void Deck			✓	
Walls and Columns			✓	
Water Tanks	✓			

*Subject to compliance with requirements and conditions. See details and updates in GFA Handbook available on the URA website.

Source: URA as at Nov 2022

URA grants bonus GFA incentives to encourage the provision of specific building features or uses. The GFA of the incentivised features are allowed above the Master Plan Gross Plot Ratio (GPR) control. These bonus GFA incentives are given to help realise various planning objectives for the city.

However, as such bonus GFA are allowed over and above the Master Plan GPR control for a site, they add to the development bulk and intensity beyond what was planned for. As there is a limit to the amount of additional bulk and intensity that can be accommodated for a site and collectively within an area without adversely affecting the effectiveness of GPR and GFA as planning tools, all bonus GFA incentives are consolidated in a menu of bonus GFA schemes and the usage of the bonus GFA items from the menu will have to observe an overall budget of 10% for additional GFA allowed beyond the Master Plan under bonus GFA schemes for each development site.

Under this framework, for a site that qualifies for multiple bonus GFA incentive schemes, the developers and QPs are free to determine which bonus GFA scheme(s) to adopt and the quantum of bonus GFA to use under each scheme (subject to compliance with the guidelines of the individual schemes), as long as the cumulative bonus GFA is within the overall budget of 10% above the Master Plan GPR. All additional GFA granted under the bonus GFA incentive schemes will not form the future development potential of the sites upon redevelopment.

Developments are eligible for the following bonus GFA incentive schemes if they comply with the relevant guidelines:

Bonus GFA Incentive Schemes	
Residential Developments (Flats and Condominiums)	Balcony Incentive Scheme
	Conserved Bungalow Scheme
	Indoor Recreation Spaces Scheme
Non-Residential Development (Commercial)	Community and Sports Facilities Scheme
	Rooftop Outdoor Rfreshment Areas on Landscaped Roofs
Non-Residential Development (Hotel)	Balcony Incentive Scheme
	Rooftop Outdoor Rfreshment Areas on Landscaped Roofs

Source: URA as at Oct 2020

Rejuvenation Incentives for Strategic Areas

URA will be rescinding the Bonus Plot Ratio (BPR) scheme introduced in 1989 in tandem with the gazette of Master Plan 2019 with the introduction of the following rejuvenation incentives:

1. Strategic Development Incentive (SDI) Scheme
2. CBD Incentive Scheme

The new package of incentive schemes aims to encourage the rejuvenation of the CBD and other strategic areas to encourage a better mix of uses and enhance urban vibrancy. Updated conditions have been announced effective from 4 April 2022 to 26 November 2024.

Source: URA as at Apr 2022

Built Environment Transformation GFA Incentive Scheme

To accelerate the adoption of Industry Transformation Map (ITM) Outcome Requirements, BCA and URA jointly launched the BE Transformation GFA Incentive Scheme. Under the scheme, developers/ building owners can enjoy up to 3% additional GFA, subject to overall cap of 10% above the Master Plan GPR, for delivering the stipulated ITM Outcome Requirements on private sites of at least 5,000m^2 GFA.

The scheme is applicable to development proposals from 24 November 2021 to 23 November 2026, for a period of five years.

More details on the scheme can be found on the BCA website.

Source: BCA as at Mar 2023

The Contractors Registry is administered by BCA to register contractors who provide construction-related goods and services to the public sector. Registration status shall be accorded only to firms which BCA considers as having sufficient resources, experience and technical expertise to undertake contracts of a nature and size as defined by the Registration Head and the grade allocated.

Except for Regulatory Workheads (RW), CRS functions as an administrative body only for the public sector procurement. As such, business entities which are not registered with BCA are not restricted from conducting business as contractors or suppliers outside the public sector. The requirements stated, as set forth shall be taken as defining only the minimum requirements expected of an applicant.

Scope of Registration

CRS is divided into seven major categories, namely Construction Workheads (CW) that covers general building (CW01) and civil engineering works (CW02), Construction Related Workheads (CR), Mechanical & Electrical Workheads (ME), Facilities Management Workhead (FM), Trade Heads (TR), Supply Heads (SY) and Regulatory Workheads (RW). There are 7 financial grades for CW, 6 financial grades for CR, ME, MW, SY and single grading for CR01, CR03, CR15, CR17, CR18, TR and RW. The detailed requirements can be obtained from the BCA website.

Tendering Limits

The Tender Price Index (TPI) published by BCA every quarter reflects the recent trend in construction costs due to changes in material prices, manpower, plant and machinery, overheads and profits. The Tendering Limit is determined using the TPI to reflect the impact of tender price movements on project value.

The tendering limit for each respective grade may be adjusted every year depending on the economy driving the construction industry in Singapore.

Construction Workheads (CW01 & CW02)	**A1**	**A2**
Tendering Limit (S$m) 1 Jul 2021 to 30 Jun 2022	Unlimited	95.0
Tendering Limit (S$m) 1 Jul 2022 to 30 Jun 2023	Unlimited	105.0
Specialist Workheads (CR, ME, FM02-04 & SY)	**Single Grade**	**L6**
Tendering Limit (S$m) 1 Jul 2021 to 30 Jun 2022	Unlimited	Unlimited
Tendering Limit (S$m) 1 Jul 2022 to 30 Jun 2023	Unlimited	Unlimited
Specialist Workheads (FM01)	**M1**	**M2**
Tendering limit (S$m) From 1 Apr 2020	Unlimited	30.0

B1	**B2**	**C1**	**C2**	**C3**
45.0	15.0	4.5	1.5	0.75
50.0	16.0	5.0	1.6	0.8
L5	**L4**	**L3**	**L2**	**L1**
15.0	7.5	4.5	1.5	0.75
16.0	8.0	5.0	1.6	0.8
M3	**M4**			
10.0	1.0			

Source: BCA as at Jun 2022

The PQM is a tendering framework based on both the price and quality attributes for the evaluation of construction tenders. PQM adopts a range of weightages for evaluation of attributes and formalises the assessment of non-price attributes into quantitative scores. PQM optimises value by awarding the tender to the tenderer with the highest combined PQM score (i.e. best offer) for the project.

The PQM applies to all public sector construction tenders under the BCA Construction Workheads (CW01 & CW02) with Estimated Construction Cost (without contingency sum) of S$3 million and above.

Key Principles of PQM

Both Price and Quality attributes will be given weightages and scored based on the guideline provided to determine the best value-for-money among all submitted proposals. The Productivity component has been removed from 1 June 2022.

The PQM procedures will be as open and transparent as possible. The weightages among the components and attributes, the number of points assigned to each attribute and the method of scoring will be made known upfront in the tender.

All tenderers can request in writing to seek feedback from the respective Government Procuring Entities (GPEs) on their individual tender performance after the tender award.

Main Features of PQM

1. Weightages for PQM
The following range of weightages can be considered, depending on project requirements such as the complexity of the project, and the extent of design input required from the tenderers.

Component	Weightages for Building tenders[1]	Weightages for Civil Engineering tenders[2]
Price	40% - 60%	50% - 70%
Quality	60% - 40%, correspondingly	50% - 30%, correspondingly

1 These refer to building projects classified under Contractors Registration System (CRS) Workhead CW01.
2 These refer to civil engineering projects classified under CRS Workhead CW02

2. Tender Submissions
The GPEs can adopt the one-envelope or the two-envelope system. A one-envelope system can be adopted for projects whereby the scoring of the specified quality attributes is based on quantified templates with no subjective judgment. An example of an objective scoring for quality attributes would be safety performance based on MOM's List of Contractors with Demerit Points. Otherwise, a two-envelope system shall be adopted.

2.1 One-envelope System
Tenderers submit the Price and Quality together in one envelope. The Price and Quality scores will be computed at the same time.

2.2 Two-envelope System
Tenderers submit the Quality envelope separately from the Price envelope. GPEs would open and compute the Quality score first, before opening the Price envelope and computing the combined scores. The tenderer with the best combined score will be awarded the contract.

Scoring Methodology

1. "Price" Component
The lowest tender price will be given the maximum Price-score (P-score). GPEs reserve the right not to consider any tender bid that is abnormally low. The Price scores of the other tenderers will be inversely proportional to the lowest tender price. The "Price" Score Computation below shall be used to compute the P-score.

$$\text{Price Score (P-score)} = \frac{\text{Lowest tender price}}{\text{Tenderer's price}} \times \text{Price weightage}$$

If price loading is applicable under Bonus Scheme of Construction Quality (BSCQ), the new price (loaded according to the Total Price Loading Factor) shall be used for computing the P-score.

When computing the P-score, the tenderer's price should not include provisional sums and value of nominated subcontracts.

Any alternative bid, by any of the firm, will be treated as a separate bid and be assessed accordingly, provided alternatives are allowed. Alternative bids are offers which functionally meet the specified technical specifications and/or terms and conditions differing from those set out in the Invitation to Tender.

PRICE QUALITY METHOD (PQM)

(Continued from page 72)

2. "Quality" Component
The Quality score will be derived from the summation of past performance, safety performance and/or project specific productivity attributes and GPEs' own quality attributes:

$$\text{Quality score (Q-score)} = \text{Past Performance} + \text{Safety Performance} + \text{GPES' Own Quality Attributes}$$

Attributes under the Quality component could include:
a. Mandatory attribute: past performance;
b. Mandatory attribute: safety performance[3]; and/or
c. GPEs' own Quality attributes.

GPEs will decide which attributes are relevant for a particular project and assign the maximum points for each quality attribute.

GPEs will set out the scoring method for the specific Quality attribute selected. The scoring method can adopt any of the following approaches:
a. Benchmark performance method;
b. Ranking method;
c. Banding method; or
d. Raw score method.

Further explanation on the above four approaches is available on the BCA website.

The tenderer with the highest total raw quality points will be given maximum Quality score. The Quality score of the other tenderers will be calculated proportionally to the highest total Quality points. The formula below shall be used to compute the Quality score (Q-score).

$$\text{Quality score (Q-score)} = \frac{\text{Tenderer's total Quality Points}}{\text{Highest total Quality Points}} \times \text{Quality Weightage}$$

3 Contractors can view their individual performance score under the electronic Builders and Contractors Registration System (eBACS).

GPEs may choose to adopt any of the following optional requirements:
a. Set a specific Quality attribute as a minimum qualifying criterion, which must be stipulated upfront in the tender documents so that potential tenderers which do not meet this criterion need not tender. This is to minimise the wastages in the firms' tendering efforts. If any agency intends to specify track record as a minimum qualifying criterion, it should not be overly onerous such that it limits the number of eligible tenderers unnecessarily; or
b. Set a minimum total Quality point for firms to meet. Firms which do not meet the minimum total Quality points will be 'disqualified' and their Price scores will not be computed. If the two-envelope system is used, the Price envelopes from the non-conforming tenders should not be opened.

Information Required in Tender Documents

The following items must be clearly made known at tender stage:
a. Price-Quality weightage.
b. Quality attributes applicable and their assigned maximum points.
c. Scoring method for each attribute, e.g. benchmark performance method or ranking method, etc. Benchmarks used in the benchmark performance method must be made known, together with how tenderers which perform better or worse than the benchmark will be scored.
d. (if applicable) Any minimum qualifying criterion for a specific quality attribute, which, if not met, would disqualify the tenderer.
e. (if applicable) Any minimum total quality points below which tenderers will not be further considered.

PRICE QUALITY METHOD (PQM)
(Continued from page 74)

Introduction of the Safety Disqualification (SDQ) Framework for Construction Tenders

The Workplace Safety & Health 2028 Tripartite Strategy Committee (WSH2028 TSC) was set up by the MOM in 2018 to chart out the WSH strategy up to 2028, so that Singapore can be renowned for best practices in WSH. One of the recommendations by the WSH2028 TSC was to enable a business environment that demands good WSH performance. The SDQ Framework will set a base for the evaluation criteria on WSH performance that are used in all public sector construction tenders of S$3 million and above called on and after 1 October 2022.

The SDQ Framework temporarily disqualifies contractors with poor WSH performance from participating in these tenders as a main contractor or first-level subcontractor[4]. Contractors meeting any of the following criteria will be disqualified from the tender:

a. Entry into MOM's Business Under Surveillance programme (BUS).
b. Barred by MOM from employing foreign employees due to the accumulation of 25 or more Demerit Points under MOM's Demerit Point System.

Revision in the Scoring Method for Joint Ventures (JVs) under the PQM Framework

BCA has standardised the approach for scoring JV tenders in view of the increasing JV arrangements in higher value construction tenders. The scoring for applicable Quality criteria will be by computing the scores according to the equity share of the JV partners to better reflect the contribution of the JV partners in a project.

4 Refers to firms appointed directly by the Main Contractor awarded the construction contract.

More details on PQM can be found on the BCA website.

Source: BCA as at Dec 2022

BUILDING AND CONSTRUCTION INDUSTRY SECURITY OF PAYMENT ACT (CHAPTER 30B)

The Security of Payment Act (SOP Act) came into operation on 1 April 2005 after the Building and Construction Industry Security of Payment Bill was implemented in November 2004. The SOP Act seeks to improve cash flow in the construction industry by giving parties the right to seek progress payment for work done, and provide fast and low-cost adjudication to resolve payment disputes.

The SOP Act was enacted to facilitate payments for construction work done or for related goods or services supplied in the building and construction industry, and for matters connected therewith. The SOP Act entitles payments to any person who has carried out any construction work; or has supplied any goods or services under a contract, is entitled to a progress payment. Henceforth, the SOP Act covers a wide spectrum of goods and services in the construction industry relating to construction work, which includes professional consultancy services.

The SOP Act shall apply to any contract that is made in writing on or after 1 April 2005, whether or not the contract is expressed to be governed by the law of Singapore.

However, the SOP Act is not applicable to any contract for the carrying out of construction work, or the supply of goods or services in relation to any residential property defined under the Residential Property Act (Cap. 274), which do not require the approval of the Commissioner of Building Control under the Building Control Act (Cap. 29); or employment contracts; or contracts that deal with construction work carried out outside Singapore, or goods or services supplied to construction work carried out outside Singapore.

The Building and Construction Industry Security of Payment (Amendment) Bill was passed in Parliament in October 2018 and the Building and Construction Industry Security of Payment (Amendment) Regulations was gazetted on 26 November 2019 and came into operation from 15 December 2019. The key amendments to the Act and/or Regulations include:

a. Expanding and clarifying the scope of the application of the Act;
b. Enhancing requirements on handling of payment claims and responses;
c. Improving the adjudication processes; and
d. Other revisions to improve the operation of the Act and Regulations.

The SOP Act:

1. Facilitates progress payments in the entire construction value chain, thereby improving cash flow;
2. Provides the statutory right to progress payments for work done and materials supplied by contractors, even if there is no such provision in their contract;
3. Renders unenforceable 'pay when paid' provision of a contract;
4. Provides a procedure of a quick and less expensive adjudication system to resolve disputes and facilitate cash flow;
5. Provides right of contractor/ service provider to suspend work or supply for non-payment after adjudication; and
6. Allows other recourses to the claimant such as the right to exercise lien on goods and enforcement of an adjudication determination as a judgment debt.

Period to Respond to Claims and Make Payment

Construction contracts:

a. The respondent must respond to a payment claim by a claimant within a maximum of 21 days.
b. After serving the payment response, the respondent must make payment within a maximum of 35 days.
c. If the contract does not stipulate the payment periods, the default period of 14 days for serving payment response will apply.

Supply of goods contracts:

a. The respondent must make payment within a maximum of 60 days for payment due.
b. If the contract does not stipulate the payment period, the default period for making payment is 30 days.
c. The respondent must provide reasons for non-payment in writing to the claimant before the due date under the amendment Bill.

Source: BCA as at Sep 2022

In 2015, BCA unveiled the 2nd Construction Productivity Roadmap as a framework to boost the construction industry's productivity by an average of 2-3% per annum to achieve a highly integrated and technologically advanced construction sector by year 2020.

Vision to Develop Collaborative Platforms and Common Standards

INTEGRATED DIGITAL DELIVERY (IDD)
(Continued from page 78)

Building Information Modelling

Within the Roadmap, Building Information Modelling (BIM) has been identified as a key technology to achieve such aims. BIM can be defined as the object-based digital representation of the physical and functional characteristics of a facility. It goes beyond the creation of 3D models for design and design coordination by creating a common platform for all parties to obtain and input information about a facility and with that provides a reliable basis for decisions during its entire lifecycle.

The Singapore BIM Guide Version 1.0 was launched in May 2012 and an updated Version 2.0 in August 2013. BCA launched a Code of Practice to set out the minimum modelling standards and regulatory information required to be provided in the BIM model. Since 2015, submissions for all new developments plans with GFA larger than 5,000m^2 are required in BIM file formats.

BCA will accept voluntary BIM e-submissions in Native BIM format with effect from 19 October 2016 (for architectural plans) and 1 October 2017 (for C&S/ MEP Engineering plans). Such submissions should be prepared in accordance with the prevailing Code of Practice.

Virtual Design and Construction

In 2017, the Virtual Design and Construction (VDC) guide was published as a reference document that provides a set of guidelines for the implementation of VDC in the Singapore context. VDC is the management of BIM models as well as people and processes in order to achieve explicit project or organisational goals and to improve performance.

This framework requires all stakeholders to commit to work collaboratively towards achieving a common set of goals, through systematically modelling what is to be built, rehearsing what is to be built, and building what was modelled and rehearsed, and through constantly measuring and narrowing deviations between what was built (real) and what was modelled and rehearsed (virtual).

Integrated Digital Delivery

In 2018, BCA launched an IDD plan to encourage more built environment sector firms to go digital. IDD involves firms and professional using ICT technologies, solutions and platforms across the entire building process and builds on BIM and VDC. The three focus areas under BCA's Implementation Plan are:

- Raising awareness on the benefits of IDD through demonstration projects.
- Developing the IDD ecosystem, with enabling solutions, platforms and standards.
- Strengthening the industry's competency in IDD.

The Common Data Environment (CDE) Data Standard was published in January 2021 for projects to ensure consistency in information requirements to support the project delivery and life-cycle management of assets. CDE comprises two components:

- Data Standard – defines what are the information required and how the information is structured for sharing and collaboration within a common data environment to deliver a project.
- Data Platform – refers to the computer system or technology platform that the data and information is stored, shared and collaborated on in a CDE.

The CDE aims to:

- Ensure consistent and better managed project information and process for projects.
- Allow project team members timely access to up-to-date, relevant and reliable project information in a common and structured environment for the delivery of a project.
- Facilitate close collaboration among project team members through sharing, exchanging, communicating and managing the project information in a common space.
- Enable project teams to derive useful performance insights for trending purpose.

More information on IDD can be found on the BCA website.

Source: BCA as at Nov 2022

Mandatory Adoption Of Specific Productive Technologies For New Developments Sold Under The Government Land Sales (GLS) Programme

Developers play a key role in driving productivity improvement; downstream construction will benefit when building designs include high impact productive technologies. The adoption of new technologies is gaining traction among industry players, especially with the tightening of foreign manpower hiring policies.

Design for Manufacturing and Assembly (DfMA) is a key pillar of Singapore's Construction Industry Transformation Map (ITM) and is a game-changing method of construction which involves construction being designed for manufacturing off-site in a controlled environment, before being assembled on-site.

As of November 2014, the adoption of Prefabricated Prefinished Volumetric Construction (PPVC) is required as a land sales condition for selected non-landed residential and hotel GLS sites. The minimum level of use of PPVC shall be 65% of the total super-structural floor of the building or the component of the building that is to be used for residential or private dwelling purposes.

The adoption of structural steel is also required as a land sales condition for selected commercial sites since February 2017. The minimum level of use of structural steel construction for selected land parcels sold under the GLS Programme shall be 80% of the total office floor area of a building.

More details on Productive Technologies can be found on the BCA website.

Source: BCA as at Feb 2020

CONQUAS was first introduced in Singapore in 1989 to measure the quality of building projects. CONQUAS 2022 is the eleventh edition of the assessment scheme after more than 30 years of implementation. The key changes include:

- Expansion of scope to cover 3 key areas of recurring feedback relating to workmanship and poor quality of materials – water seepage, ponding at common areas and glass shattering; and
- Revision of score weightages arising from expansion of assessment scope

The assessment of CONQUAS consists of 4 components. Each component is further divided into different items for assessment. CONQUAS 2022 will apply to projects with construction tenders called from 1 June 2022.

Components to be Assessed	Category of Development		
	Private Housing	Public Housing	Non-Housing
1. Internal Finishes	60%	55%	50%
2. Installation Methods Verification and Functional Tests	20%	25%	30%
3. External Finishes	20%	20%	20%
Sub Total CONQUAS Score	**100%**	**100%**	**100%**
4. Bonus Points	8	7	7
Total CONQUAS Score	**108**	**107**	**107**

Note:

(i) For mixed development, the project will take the Category of the development type where the GFA is more than 50% of the total GFA. E.g. Project with 70% private housing and 30% commercial will follow the weightage under the private housing category.

In addition, the 3-tier CONQUAS scheme was introduced to help developer/ contractors further raise the quality of their new private residential developments[1]. The 3-tier CONQUAS scheme will apply to all CONQUAS applications for new private residential developments[1].

1 Includes private mixed developments with residential component.

CONSTRUCTION QUALITY ASSESSMENT SYSTEM (CONQUAS)

(Continued from page 82)

The building is assessed primarily on workmanship standards achieved through factory and site inspection. For projects using DfMA technologies, assessments will be done throughout the construction process with the Installation Methods Verification and some of the Functional Tests carried out in the factory. To ensure robustness of the CONQUAS scheme, major defects detected during the internal finish assessment will be taken into consideration. Adverse feedback from end-users on major defects that surface during the defects liability period of a project will also be considered when finalising the CONQUAS score.

CONQUAS Banding

Firms will be banded based on criteria such as the firm's past CONQUAS track records. The quality of private residential CONQUAS projects will be reflected by bands too. Home buyers will be able to access the CONQUAS banding on the Quality Housing Portal when the banding system is launched.

For developers, the banding can serve as branding for those who are committed to delivering quality developments. Developers can similarly use the CONQUAS banding on the portal to appoint good performing builders for their projects. Correspondingly, builders should strive to deliver consistently high quality work, which would be reflected via the accorded CONQUAS bands.

More information on the CONQUAS 2022 can be found on the BCA website.

Source: BCA as at Nov 2022

QUALITY MARK (QM)

BCA QM for good workmanship scheme was launched on 1 July 2002 to help developers meet the rising expectation of Singaporeans for better quality homes.

Under the Scheme, BCA will assess every unit of newly completed private residential projects. The QM certificate will be issued to individual apartment unit that achieve a score of at least 85[1] out of 100 points (a minimum CONQUAS score for internal finishes), without any major defects and water seepage in the toilets/ bathrooms and windows. The QM certificate certifies the condition of the unit at the time of inspection.

QM is required for residential sites or the residential component of mixed developments on site sold on or after 30 June 2022 under the GLS programme. QM is also applicable as one of the ITM outcome requirement for projects that have applied for the Built Environment Transformation GFA Incentive Scheme. QM adoption is voluntary beyond this.

The scope of assessment will be the construction workmanship standards of the internal finishes of the 6 architectural elements including floor, internal wall, ceiling, door, window, and components (e.g. fixtures such as wardrobe, kitchen cabinet, vanity top, etc.).

The assessment for the 6 architectural elements will cover all locations within the units (i.e. bedrooms, bathrooms, kitchen, living & dining rooms, utility yard, where applicable). In addition, the assessment will include water ponding test for bathrooms. Water-tightness tests on windows are optional. The assessment does not cover quality of material or issues of design or aesthetic preferences.

The Tiered Rating System ("Star", "Excellent" and "Merit") provides recognition to developers and builders that achieve quality excellence beyond the minimum requirements.

1 Applies to QM projects with construction tender called from 1 June 2020.

More information on QM can be found on the BCA website.

Source: BCA as at Mar 2023

Singapore adopts a national, strategic and long-term approach to achieve sustainable, continuous improvement in WSH performance. The WSH 2015 and WSH 2018 National Strategies have brought about significant WSH improvements over the years.

Building on the foundation of WSH 2015 and WSH 2018, the WSH 2028 Tripartite Strategies Committee presented 3 strategies for the next 10 years:

1. Strengthen WSH ownership
2. Enhance focus on workplace health
3. Promote technology-enabled WSH

Workplace Safety and Health Act (WSHA)

The WSHA, which came into effect on 1 March 2006, emphasise the importance of cultivating good safety habits in all individuals so as to engender a strong safety culture in the workplace. It requires stakeholders to take reasonably practicable measures to ensure the safety and health of persons at the workplace.

The WSHA has four key features:
1. It places the responsibility on stakeholders that have it within their control to ensure safety at the workplace.
2. It focuses on workplace safety and health systems and outcomes, rather than merely on compliance.
3. It facilitates effective enforcement through the issuance of remedial orders.
4. It imposes higher penalties for non compliance and risky behaviour.

Launch of CheckSafe

MOM launched CheckSafe on 21 January 2021, which can be used to check and compare construction companies' safety track records. Information available includes injury data (e.g. number of fatal injuries) and enforcement data (e.g. stop work orders, demerit points issued, placement on Business Under Surveillance (BUS) Programme, conviction records).

Liabilities and Penalties

The WSHA states a general maximum penalty for offences. The penalties are shown in the tables below.

Offence	Maximum Fine	Maximum Imprisonment	Conditions
Not complying with Remedial Order	S$50,000 And additional fine of S$5,000 for each day of continued offence	12 months	Either or both
Not complying with Stop Work Order	S$500,000 And additional fine of S$20,000 for each day of continued offence	12 months	Either or both

Table 1: Not Complying with a Remedial Order or Stop Work Order

Type of Offender	Maximum Fine		Maximum Imprisonment	Conditions
	1st conviction	Repeat Offenders		
Individual person	S$200,000	S$400,000	2 years	Either or Both
Corporate Body	S$500,000	S$1,000,000	N.A.	N.A.

Table 2: General Penalties (for offences where no penalty is expressly provided in the WSHA)

Note: If the previous offence caused the death of a person, any subsequent offence that causes the death of another person will have a maximum fine that is doubled.

Workplace Safety and Health (Design for Safety) Regulations (DfS)

In 2008, MOM and WSH published the Guidelines on DfS of Buildings and Structures which were adopted on a voluntary basis. To tap on the benefits of DfS to achieve significant and widespread WSH improvement in the building industry, the WSH (Design for Safety) Regulations came into operation on 1 August 2016. The key provisions of the DfS are:
a. To place duties on the various stakeholders involved in a construction project.
b. To require implementation of a DfS review process throughout every phase of the construction project.
c. To require a DfS register for all construction projects.
d. To allow developers to appoint a DfS professional.
e. To mandate it for projects with contract value of S$10 million and above.

Source: MOM as at Sep 2022

The WICA provides injured employees with a low-cost and expeditious alternative to common law to settle compensation claims. To claim under WICA, the employee only needs to prove that he was injured in a work accident or suffered a disease due to work. Engaging a lawyer is not required to file a WICA claim. Under WICA, the employer (or employer's insurer) is liable to pay the compensation regardless of who caused the accident/disease, and even after the employment has ceased or the Work Pass (of a foreign worker) has been cancelled. The amount of compensation is computed based on a fixed formula and is subject to caps. Dependents of deceased employees are also eligible to claim Work Injury Compensation. An injured employee can claim from either WICA or common law, but not from both, and has up to 1 year from the accident to decide which to claim from.

Coverage

Covered	1. All employees engaged under a "contract of service" or "contract of apprenticeship" with an employer, regardless of salary level, age or nationality.
Not Covered	1. Independent contractors and the self-employed 2. Domestic workers 3. Uniformed personnel - members of the Singapore Armed Forces, Singapore Police Force, Singapore Civil Defence Force, Central Narcotics Bureau and Singapore Prison Service

Compensation

Compensation is payable when an employee:

1. Suffered an injury by accident arising out of and in the course of employment[1];
2. Suffered an injury while on an overseas assignment;
3. Contracted an occupational disease; or
4. Contracted a disease due to work-related exposure to biological or chemical agents.

1: Refers to an accident that: (i) happened during working hours/ overtime or while on official duties ("in the course of employment") and (ii) happened due to work ("out of employment")

Three compensation benefits can be claimed:

1. Medical Leave Wages

	Outpatient medical leave (MC)	Hospitalisation leave
Full pay	Up to 14 days	Up to 60 days
2/3 pay	15th day onwards, up to 1 year from accident	61st day onwards, up to 1 year from accident

2. Medical Expenses

The employer is required to pay for medical expenses related to a work accident up to the maximum limit, which is $45,000 or 1 year from the date of the accident, whichever comes first.

3. Lump Sum compensation for Permanent Incapacity or Death

	Permanent Incapacity[2] Compensation		Death Compensation	
	From 1 Jan 2016 to before 1 Jan 2020	From 1 Jan 2020	From 1 Jan 2016 to before 1 Jan 2020	From 1 Jan 2020
Minimum	S$88,000 x (% PI)	S$97,000 x (% PI)	S$69,000	S$76,000
Maximum[3]	S$262,000 x (% PI)	S$289,000 x (% PI)	S$204,000	S$225,000

2: Percentage Permanent Incapacity (% PI) is based on doctor's assessment after the employee's medical condition stabilises. Doctor makes the assessment based on a set of guidelines in the "Guide to the Assessment of Traumatic Injuries and Occupational Diseases for Work Injury Compensation".

3: An additional 25% of the compensation amount is awarded if an injured employee suffered total permanent incapacity (i.e. 100% PI).

From 1 September 2020, employees on light duties due to work injuries will be compensated for their lost earnings based on their Average Monthly Earnings (AME). Employers must also report all work-related medical leave or light duties to MOM.

More details on the WICA can be found on the MOM website.

Source: MOM as at Jan 2023

MAN-YEAR ENTITLEMENT (MYE)

The MYE Allocation System is a Work Permit allocation system implemented by MOM to provide entitlements to main contractors (through a prior approval application) to employ foreign workers from the People's Republic of China (PRC) and Non-Traditional Source (NTS) countries including India, Sri Lanka, Thailand, Bangladesh, Myanmar and Philippines.

MYE reflects the total quota of foreign construction workers allocated to a main contractor for a specific construction project. Hence, MYE allocated to a particular project cannot be transferred to another project. Main contractors cannot allocate or sell their MYE to other contractors not involved in the same project. Main contractors which do so will be barred from applying for new Work Permits in future. A main contractor can however request for an increase in MYE if the project value has increased due to additional work or variation orders awarded by the developer.

Computation of MYE for Construction

Project Value		NTS Worker Entitlements
a (i). Building Projects (below S$10 million)		
Less than	S$0.5 million	0
First	S$1 million	1.325 man-yrs per S$100,000 value
Next	S$9 million	7.950 man-yrs per S$1 million value
a (ii). Building Projects (at or above S$10 million)		
Less than	S$0.5 million	0
First	S$1 million	1.223 man-yrs per S$100,000 value
Next	S$9 million	7.338 man-yrs per S$1 million value
Next	S$20 million	4.892 man-yrs per S$1 million value
Next	S$70 million	3.261 man-yrs per S$1 million value
Next	S$100 million	2.446 man-yrs per S$1 million value
B. Civil Engineering (CE) Projects		
Less than	S$0.5 million	0
First	S$1 million	0.543 man-yrs per S$100,000 value
Next	S$9 million	3.261 man-yrs per S$1 million value
Next	S$20 million	2.174 man-yrs per S$1 million value
Remaining balance above	S$30 million	1.087 man-yrs per S$1 million value

MYE:
a) Is the total number of Work Permit holders a main contractor is entitled to employ, based on the value of projects/contracts awarded by developers/ owners; and
b) Is allocated in the form of the number of "man-years" required to complete a project. (1 man-year = 1-year employment under a Work Permit).

Prior Approval (PA)

PA is an approval for companies to employ migrant workers from NTS countries and the PRC. It indicates the number of migrant workers the company is allowed to employ from these countries and also determines the number of workers who can have their Work Permits renewed, or who can be transferred from another company in Singapore.

Supporting Industry Transformation in the Construction Sector

The construction sector has been impacted by the COVID-19 pandemic and the significant and repeated disruptions to manpower inflow for the sector over the two years of the pandemic reaffirmed the need for the sector to press on with productivity improvements to become more manpower-lean.

The government will make the following policy changes from the Construction sector to support the industry transformation and incentivise firms to hire higher-skilled foreign workers:
a. Reduce the Dependency Ratio Ceiling (DRC) from 1:7 to 1:5 (i.e. 1 local employee to 5 Work Permit Holders (WPHs) or S Pass Holders);
b. Phase out MYE framework; and
c. Revise the levy structure for WPHs.

Changes will take effect from 1 January 2024.

Details can be found on the MOM website.

Source: MOM as at Aug 2022

FOREIGN WORKER LEVY (FWL)

Employers are required to pay a monthly FWL when they employ a foreign worker in Singapore. FWL is a pricing mechanism to regulate the number of foreign workers. The levy liability starts from the day the Temporary Work Permit or Work Permit is issued, whichever is earlier. It ceases upon expiry or cancellation of the Work Permit.

Source Countries

Employers can employ foreign workers from Malaysia, the People's Republic of China (PRC), Non-traditional source (NTS) countries including India, Sri Lanka, Thailand, Bangladesh, Myanmar and Philippines, and North Asian source (NAS) countries including Hong Kong (HKSAR passport), Macau, South Korea and Taiwan.

Maximum period of employment

Nationality	Type of worker	Maximum period of employment
NTS, PRC	Basic-Skilled[1] (R2)	14 years
NTS, PRC	Higher-Skilled[2] (R1)	26 years
NAS, Malaysia	All sectors	No maximum period of employment

[1] Basic-Skilled workers are workers holding the Skills Evaluation Certificate (SEC) or Skills Evaluation Certificate (Knowledge) (SEC(K)).

[2] Higher-Skilled workers are workers who have been upgraded through various means including CoreTrade, Multi-Skilling Scheme, Direct R1 Pathway or the Market-Based Skills Recognition Framework (MBF).

Levy Rate

Employers can employ 7 Work Permit holders for every full-time local employee. In addition to quota, NTS and PRC workers are subject to MYE requirements. They may qualify for a waiver if they have at least 3 years of experience in the construction sector. MYE does not apply to Malaysian and NAS workers.

Skills Level	NTS and PRC	
	MYE Waiver	MYE
Higher-skilled (R1)	S$600	S$300
Basic-skilled (R2)	S$950	S$700

Skills Level	Malaysia, NAS	Off-site Construction
Higher-skilled (R1)	S$300	S$300
Basic-skilled (R2)	S$700	S$700

Minimum Percentage of Higher-Skilled (R1) Workers

From 1 January 2019, firms that do not meet the 10% R1 minimum will not be able to hire or renew R2 construction workers and will also have the Work Permits of any excess R2 construction workers revoked.

Supporting Industry Transformation in the Construction Sector

Levy structures will be revised effective from 1 January 2024 to support the industry transformation and incentivise firms to hire higher-skilled foreign workers.

The new levy structure aims to support firms that adopt more productive technologies such as DfMA, by lowering the levy rates for off-site construction. Higher-skilled (or "R1") workers will continue to be subject to lower levy rates to encourage firms to employ skilled and productive WPHs. The new levy rates will also encourage firms to diversify their WPH workforce by hiring workers from Malaysia, PRC and NAS, which will be subjected to lower levy rates than NTS workers.

Levy rates for WPHs will be revised as follows:

Skills Level	NTS	Malaysia, NAS, PRC	Off-site Construction
Higher-skilled (R1)	S$500	S$300	S$250
Basic-skilled (R2)	S$900	S$700	S$370

Note: BCA will announce the facilities eligible for off-site levy rates closer to 2024.

More details on FWL and the revised levy structure can be found on the MOM website.

Source: MOM as at Sep 2022

BUILDSG TRANSFORMATION FUND (BTF)

The Ministry of National Development (MND) announced on 6 March 2019 that existing funding schemes in the areas of DfMA, IDD and Green Buildings will be consolidated under the BTF. The various schemes under the BTF amount to about S$770 million.

BTF facilities transformation plans for built environment firms under the BE ITM areas, as well as enables individuals to tackle the key transformation areas through upskilling and training.

The schemes consolidated under the BTF are tabulated below.

Workforce Development	
iBuildSG Scholarship and Sponsorship	The iBuildSG Scholarship and Sponsorship (in collaboration with industry firms) supports students of high calibre and in-service personnel pursuing full-time and part-time BE-related courses at local universities, polytechnics, ITE or BCA Academy.
iBuildSG Workforce Training and Upgrading (WTU)	The iBuildSG WTU supports firms' upgrading of workers' skills via co-funding of selected skills assessment and training courses. The WTU scheme ceased on 31 March 2022.
Transformation	
Built Environment Transformation Gross Floor Area Incentive Scheme	Additional GFA for developers/building owners adopting enhanced Construction Industry Transformation Map (ITM) standards in areas of digitalisation, productivity and sustainability ("ITM Outcome Requirements") in private sector developments.
Growth and Transformation Scheme (GTS)	The GTS is designed to support a collective effort, by multiple partnering companies, to strengthen technical capabilities as well as corporate, digital and innovation practices, to achieve mutually beneficial outcomes over a sustained period.
DfMA and IDD	
Productivity Innovation Project (PIP)	PIP supports Singapore-registered firms to build up their capability in DfMA technologies and IDD and improve site processes in order to achieve higher site productivity.
Offsite Construction Special Scheme (OCSS)	The OCSS is a voluntary manpower incentive scheme that encourages the shift towards DfMA and more off-site work. The scheme allows eligible DfMA production facilities to employ an allocated number of work permit holders at the lower Man-Year Entitlement levy rates, depending on the facility type and manpower profile.
Public Sector Construction Productivity Fund (PSCPF)	PSCPF supports government agencies to use DfMA technologies for their construction projects.
Investment Allowance Scheme (IAS)	IAS supports the mechanisation efforts of Singapore-registered firms through providing tax incentives for capital investments on productive construction equipment.
Productivity Solutions Grant (PSG)	PSG supports local SMEs in transforming digitally by subsidising the cost of adopting pre-approved digital solutions which enhances productivity under the Construction and Facilities Management Industry Digital Plan (IDP).

BUILDSG TRANSFORMATION FUND (BTF)

(Continued from page 94)

Green Buildings/ Facilities Management	
Building Retrofit Energy Efficiency Financing (BREEF) Scheme	The BREEF scheme supports building owners in obtaining financing from participating financial institutions to offset upfront costs for energy efficient retrofits of existing buildings and repay the loans through energy savings reaped.
GMIS for Existing Buildings 2.0 (GMIS-EB 2.0)	Cash incentive to lower upfront costs of energy efficiency retrofits for building owners who achieve higher energy performance standards (i.e. Platinum, Super Low Energy, and Zero Energy) for their buildings.
Grant for Low-GWP Refrigerant Chillers (LoGR)	To encourage owners and operators of existing buildings to adopt water-cooled chillers using refrigerants with low GWP early, before the ban on sales of water-cooled chillers using high-GWP hydrofluorocarbons (HFC) refrigerants takes effect in 2022. The grant will support part of the cost incurred for building owners and operators to switch to climate-friendly low-GWP refrigerant water-cooled chillers.
Integrated Facilities Management and Aggregated Facilities Management (IFM/AFM) Grant	Support service buyers and FM firms to build capabilities in adopting IFM/AFM, including the adoption of progressive procurement, processes and technologies.
Research & Innovation	
Cities of Tomorrow (CoT) R&D Programme	The CoT R&D programme is a multi-agency effort, led by the MND, to identify challenges that cities face and develop R&D solutions to address the challenges. The key research thrusts that are supported include Advanced Construction, Resilient Infrastructure and Greater Sustainability.
Green Buildings Innovation Cluster (GBIC)	GBIC is a one-stop integrated Research & Innovation hub that seeks to accelerate the adoption of promising building energy efficient technologies and solutions through programmes such as the GBIC Building Energy Efficient Demonstrations Scheme and the Super Low Energy Building Smart Hub.
Built Environment (BE) Robotics R&D Programme	The BE Robotics R&D programme supports the research, development and deployment of innovative robotics with practical implementation and commercialisation potential in areas such as manufacturing, assembly as well as smart and sustainable assets.
2-Stage Innovation Grant (iGrant)	iGrant supports the industry in conducting fast track, proof-of-concept type of Research & Innovation in areas such as Advanced Construction and IDD for subsequent quick development.
Built Environment Accelerate to Market Programme (BEAMP)	BEAMP supports the fast-tracked development and commercialisation of innovative solutions supported by Gov-PACT initiative, which connects innovators with firms in the BE sector seeking to solve identified challenges through the use of their solutions.

Source: BCA as at Mar 2023

The Construction ITM, launched in 2017, envisioned an advanced and integrated sector with widespread adoption of leading technologies, led by progressive and collaborative firms and supported by a skilled and competent workforce.

Recognising key global trends which impact the sector such as digital revolution, rapid urbanisation and climate change, the ITM identified the following key transformation areas to address the challenges faced by the sector:
1. Integrated Digital Delivery (IDD)
2. Design for Manufacturing and Assembly (DfMA)
3. Green buildings

By 2025, the ITM targets to have 80,000 personnel trained in DfMA, IDD and green building capabilities.

Building on the foundation of the Construction and Real Estate ITMs, the BE ITM crystallises the collective vision and strategies to transform the built environment sector. Announced in September 2022, the refreshed BE ITM will help stakeholders within the sector collaborate more effectively across the value chain. The key transformation areas are:
1. Integrated Planning and Design (IPD)
2. Advanced Manufacturing and Assembly (AMA)
3. Sustainable Urban Systems (SUS)

Integrated Planning and Design (IPD)

The IPD will build on existing efforts for IDD, which refers to the use of digital technologies to integrate work processes and connect stakeholders working on the same project throughout the construction and building life-cycle. Design consideration for the building's entire life cycle, including Facilities Management are factored in at the design stage, enabled by digitalisation, Common Data Environment (CDE) standards and progressive procurement.

Refer to Page 78: Integrated Digital Delivery (IDD) for more information.

Advanced Manufacturing and Assembly (AMA)

Through AMA to enhance the efficiency of the supply chain and construction process by mainstreaming DfMA, it has helped firms reduce their reliance on foreign manpower and raise productivity. DfMA comprises a continuum of various technologies and methodologies that promote offsite fabrication, from prefabricated components to fully integrated assemblies across the structural, architectural and MEP disciplines.

The list below outlines some examples of DfMA elements:

a. Advanced Precast Concrete System (APCS) - APCS is a construction method that adopt precast slabs and applies four features (each with at least 65% coverage) under the '3S' principles of Standardisation, Simplicity and Single integrated elements.

b. Mass Engineered Timber (MET) - MET is a building material comprising engineered wood products with improved structural integrity. Cross Laminated Timber (CLT) is one form of MET which is fabricated by binding layers of timber at 90 degrees with structural adhesives to produce a solid timber panel.

c. Prefabricated Prefinished Volumetric Construction (PPVC) - PPVC is a construction method whereby free-standing volumetric modules (complete with finishes for walls, floors and ceilings) are (a) constructed and assembled or (b) manufactured and assembled, in an accredited fabrication facility, in accordance with any accredited fabrication method, and then installed in a building under building works.

d. Prefabricated MEP - Prefabricated MEP systems are MEP components and equipment that are integrated into a sub-assembly off-site and then installed on site.

e. Structural Steel Construction - Steel has high strength-to-weight ratio and can be prefabricated with highly accurate automation machineries or facilities, minimising the need for rework due to errors.

At the same time, BCA is also working to establish new Integrated Construction Parks (ICPs) across Singapore, providing a platform for firms to develop their DfMA solutions and production facilities.

Also refer to Page 45: Building Control (Buildability and Productivity) Regulations 2011 for more information on the integration of DfMA into the buildability framework.

Sustainable Urban Systems (SUS)

SUS will facilitate the ramping up of decarbonisation efforts in the industry for a more sustainable and liveable built environment. Refer to Page 55: Environmental Sustainability for more information.

Source: BCA as at Sep 2022

The Singapore Government releases land regularly through land sales programme for private sector development. Each programme is planned for and announced every 6 months. The GLS sites are released through two main systems - the Reserve List and the Confirmed List.

Under the Reserve List, the Government will release a site for sale if:

- An interested party submits an application for the site to be put up for tender with an offer of a minimum purchase price that is acceptable to the Government; or
- There is sufficient market interest in the form of more than one unrelated party applications that are close to the Government's Reserve Price for the site within a reasonable period.

Available land sites under the First Half 2023 GLS Programme

A. Confirmed List

S/N	Location	Site Area (ha)	Gross Plot Ratio	Sales Agent	Estimated Launch Date
	Residential Sites				
1	Jalan Tembusu	2.05	3.5	URA	Mar-23
2	Tampines Street 62 (Parcel B) (EC)	2.80	2.5	HDB	Mar-23
3	Lentor Central	1.47	2.8	URA	Apr-23
4	Champions Way	1.44	2.1	URA	May-23
5	Media Circle	1.06	2.9	URA	Jun-23
	White Sites				
6	Marina Gardens Crescent	1.73	4.2	URA	Jun-23
7	Jurong Lake District	6.80	-	URA	Jun-23

B. Reserved list

S/N	Location	Site Area (ha)	Gross Plot Ratio	Sales Agent	Estimated Launch Date
	Residential Sites				
1	Pine Grove (Parcel B)	2.50	2.1	URA	Available
2	Clementi Avenue 1	1.34	3.5	URA	Available
3	Senja Close (EC)	1.01	3.0	HDB	Available
4	Lentor Gardens	2.06	2.1	URA	Apr-23
5	Lorong 1 Toa Payoh	1.55	4.2	URA	May-23
6	Plantation Close (EC)	2.01	2.8	HDB	Jun-23
	Commercial Sites				
7	Punggol Walk	1.00	1.4	URA	May-23
	White Sites				
8	Woodlands Avenue 2	2.75	4.2	URA	Available
	Hotel Sites				
9	River Valley Road	1.02	2.8	URA	Available

More details on the available land sites under the GLS Programme are found on the URA website.

Qualifying Certificate (QC)

Under the Residential Property Act (RPA), any housing developer that is not considered a Singapore company has to apply for a QC when it purchases residential land for development, other than from the Government.

With effect from 6 February 2020, the Ministry of Law will allow publicly listed housing developers with a substantial connection to Singapore to be treated as a Singapore company within the meaning of the RPA when they acquire residential land for development.

Refinements were announced on 29 June 2021, with immediate effect, on how the shareholding interest criterion is assessed.

Sources: URA, SLA as at Mar 2023

COVID-19 (Temporary Measures) Act 2020 (COTMA)

The COTMA for BE sector commenced on 30 November 2020 to support stakeholders in the sector affected by disruptions resulting from the COVID-19 pandemic. It ensures no single stakeholder bears an undue share of the burden imposed by COVID-19. Parts of COTMA of note are as follows:

Part 8A provides a universal Extension of Time (EOT) of 122 days to address delays that arose during the period between 7 April 2020 and 6 August 2020 (both dates inclusive) for construction contracts.

Part 8B requires the co-sharing of additional non-manpower-related qualifying costs between contracting parties due to delays caused by COVID-19 during the period between 7 April 2020 and 28 February 2022 (both dates inclusive).

Part 10A provides a relief framework to allow contract parties to adjust the contract sum for their projects, to address foreign manpower salary cost in respect of WPHs due to the pandemic. The relief period for Part 10A will be from 1 October 2020 to 30 June 2022 (or any extended date as prescribed).

Refer to BCA's website for the commencement date of the legislative relief and further details.

Ex-gratia EOT for Public Sector Projects

Common EOT for delay due to loss of productivity is granted on an ex-gratia basis for public sector construction contracts for the following periods:

7 August 2020 to 31 December 2020: 49-day ex-gratia EOT to be granted

1 January 2021 to 30 June 2021: 34-day ex-gratia EOT to be granted

1 July 2021 to 28 February 2022: 33-day ex-gratia EOT to be granted

Prolongation Cost-sharing for Public Sector Projects

For eligible contracts with awarded contract sum up to S$100mil, GPEs will co-share 0.1% of awarded contract sum for every month of delay arising from COVID-19 events (substantiated with EOT).

The total cost-sharing under COTMA Part 8B and ex-gratia co-sharing of contractor-owned equipment would still be subject to the monthly cap of 0.2% of contract sum and overall cap of 1.8% of the contract sum.

As the relief period under COTMA Part 8B ended on 28 February 2022, the above simplified claim formula will cease to apply for any prolongation cost claims arising from COVID-related delay after 28 February 2022.

Additional Measures to Support the Sector

The authorities continue to provide support measures to help the construction sector mitigate the impact as the pandemic develops. Additional measures include:

From 7 May 2021, BCA and MOM will introduce a temporary scheme for six months to allow new PRC WPHs to obtain their skills certification in Singapore, in view of the further tightening of border measures with India.

Singapore Reverts to DORSCON Green

Singapore has lowered its DORSCON level from Yellow to Green as at 13 February 2023, and existing community safe management measures will be stepped down.

Refer to BCA's website for the latest COVID-19 support measures and information.

Sources: BCA as at Feb 2023

Eden, Singapore

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