

DEFINITION

Category PC1A

Precaster that has the financial, manpower management, plant and design capabilities to produce precast concrete element(s) in their respective product group with automation in a factory-controlled environment with a total contract value of more than or equal to S\$30 million in the past 3 years.

Category PC1

Precaster that has the financial, manpower management, plant and design capabilities and track record to produce precast concrete element(s) in their respective product group with a total contract value of more than or equal to S\$30 million in the past 3 years.

Category PC2

Precaster that has the financial, manpower management, plant and design capabilities and track record to produce precast concrete element(s) in their respective product group with a total contract value of more than or equal to S\$5 million but less than S\$30 million in the past 3 years.

Category PC3

Precaster that has the financial, manpower management, plant and design capabilities and track record to produce precast concrete element(s) in their respective product group with a total contract value of less than \$5 million in the past 3 years.

Precaster Accreditation Scheme Criteria & Grading Schedule

Annex 1

S/N	Assessment Area	Requirements	CATEGORY			
			PC1A	PC1	PC2	PC3
1	Management and Facilities					
1.1	Financial	1.1.1 Minimum Paid-up Capital & Net Worth (see Note 1)	S\$2M (required for Min. Paid-up Capital only)	S\$1M each	S\$250K each	S\$50K each
1.2	Human Resources	1.2.1 Professional, Supervisory & Technical Personnel (see Note 2)				
		a) Professional	3	2	1	0
		b) Supervisory	4	3	2	2
		c) Technical	10	8	5	3
		1.2.2 Training	a) Training programme and recent training records for staff with at least 2 years of service b) At least <u>two</u> supervisors trained in management and supervision of precast concrete projects in the past 12 months, preferably in the relevant Good Industry Practice (GIP) workshop and courses conducted by BCA Academy, Singapore b) At least <u>one</u> supervisor trained in management and supervision of precast concrete projects in the past 12 months, preferably in the relevant Good Industry Practice (GIP) workshop and courses conducted by BCA Academy, Singapore c) In-house training of workers for precast concrete production by QA/QC Supervisor or Engineer			
1.3	Management Systems	1.3.1 Management Systems	ISO 9001			
			ISO14001	Not required		Not required
		1.3.2 Quality Plan	OHSAS 18001 (or SS506 or BizSafe L3 or ISO45001)			
1.4	Plant Facilities	1.4.1 Capacity of Plants (a) Annual concrete volume output OR production & storage floor area	a) Gross Plot Ratio (GPR) of at least 1.4. b) Min 10,500m ³ annual concrete volume OR Min. 15,000m ² of production & storage floor area	Min. 10,500m ³ annual concrete volume output OR Min. 15,000m ² of production & storage floor area	Min. 10,500m ³ annual concrete volume output OR Min 3,500m ² of production & storage floor area	Min. 4,500m ³ annual concrete volume output OR Min. 1,500m ² of production & storage floor area
		(b) Monitoring and Documentation of monthly concrete volume production output of plant (m3)	Required			

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			PC1A	PC1	PC2	PC3
1	Management and Facilities (cont'd)					
1.4	Plant Facilities (cont'd)	1.4.2 i) Equipment (a) Scales & Measuring i) Measuring tape ii) Spirit level iii) Leveling device iv) Electronic laser device	Items(a) i) to iv)		Items(a) i) to iii)	Items(a) i) to iii)
		(b) Concrete testing i) Test cube mould ii) Vibration hammer/ table iii) Slump test set iv) Compressive strength test machine	Items(b) i) to iv)		Items(b) i) to iii)	Not required
		(c) Lifting i) Shackle ii) Lifting wire iii) Lifting chain iv) Lifting belt v) Lifting frame vi) Lifting clasper vii) Forklift viii) Mobile crane viii) Overhead/Gantry crane	Items(c) i) to viii)	<i>Gantry crane capacity 10T & 16T or 20T</i>	Items(c) i) to vii) <i>Gantry crane capacity 10T or 16T</i>	Items(c) i) to vi) <i>Gantry crane at least 1 no. 5T</i>
		(d) Formwork i) Timber ii) Steel iii) Engineered System iv) Metal flatbed workstation & appurtenances	Items (d) i) to iii) or iv)		Items (d) i) to iii)	At least item(d) i) and ii)
		(e) Prestressing In Product Groups in GS2, GS3 & GC1 i) Prestressing machine ii) Saw machine iii) Stressing jack	Items(e) i) to iii)		Items(e) i) to iii)	Not required

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1	Management and Facilities (cont'd)					
1.4	Plant Facilities (cont'd)	1.4.2 ii) Calibration	For Load sensors, Pressure gauges, Moisture meters and Data loggers			Not required
		1.4.3 Mechanisation				
		In production, storage and packaging e.g. pallet circulation system, robotics, auto concrete spreader, auto bar bending, vibration table, external vibrator, steel mould forming machines	Must have Pallet Circulation System or Carousel Tunnel Segment <u>and</u> Curing Chamber	Required	Required	Not required
		1.4.4 Information Technology (IT)				
		For Communication, Documentation and Record	LAN, Electronic Real-time Processing System, Data Management System, BIM, Biometric Authentication System (BAS)	LAN, Internet access	Internet access	
2	Track Record and Production Drawings					
2.1	Track Record	2.1.1 Minimum Contract Value (CV) for past 3 yrs <ul style="list-style-type: none"> CV from the Group of Companies (Precast related) can be considered CV accumulation of latest 3 years 	CV ≥ S\$30.0m <u>OR</u> for newly set-up plant, 1 st year - provisional certification 2 nd year - S\$10.0m 3 rd year - S\$20.0m	CV ≥ S\$30.0m	S\$5.0m ≤ CV < S\$30.0m	CV < S\$5.0m
2.2	Shop drawings production	2.2.1 Drawing staff	1 BIM Manager At least 3 staff for drawing and 2 staff are BIM-Certified	At least 2 staff for drawing and 1 staff is BIM-certified	At least 1 staff for drawing	Not required
		2.2.2 Preparation & Control of Shop drawings	Drawing Manual and procedure for control of drawing for production		Procedure for control of drawing for production	Not required

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2	Track Record and Production Drawings (cont'd)					
2.2	Cont'd	2.2.3 IT Provisions and Equipment BIM software or others – e.g. Revit, Tekla structures, Nemetchek All Plan Precast or similar software. Hardware like personal computers, workstations, servers, plotters & printers, data centre	BIM software in at least 3 nos. desktop computers	BIM software in at least 2 nos. desktop computers	Autocad in at least 1 no. desktop computer	Not required
3	Quality Control in Production					
3.1	Raw Material Maintain material specifications & their test records	3.1.1 Concrete	Required			Not required
		3.1.2 Cement	Required			
		3.1.3 Sand	Required			
		3.1.4 Aggregate	Required			
		3.1.5 Admixture	Required			
		3.1.6 Reinforcing Steel Bar	Required			
		3.1.7 Prestressing Steel In Product Groups:GS2, GS3 & GC1	Required			Not required
		3.1.8 Miscellaneous materials e.g. metal inserts, lifting devices, packers and embedded steel	Required			
3.2	Concrete Mix Supply If external RMC supply, pls maintain test records of materials and compressive concrete cube tests	3.2.1 Certification of Batching Plant (For overseas plant, it shall be certified to ISO 9001 and RMC specified to EN206-1:2009)	Required			Not required
		3.2.2 Storage and Handling of Aggregates * Not applicable for concrete supplied by RMC plants	Fully enclosed storage for fine and coarse aggregates	Required (sheltered or covered, and prevent intermingling of aggregates)		
		3.2.3 Concrete Testing	a) Tested by SAC-SINGLAS accredited laboratory or an ILAC- MRA partner b) Records of concrete test cubes compressive strength reports c) PC1 required to have in-house testing equipment and tests procedures			

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3	Quality Control in Production (cont'd)					
3.3	Production	3.3.1 Operation Control	Quality Plan and QA/QC procedures			Method Statements
		3.3.2 Inspection & Test Plan	ITP for Precast Concrete Production and ITP for Batching Plant		ITP for Precast Concrete Production	Maintain test records for concrete and rebar
3.4	Product Quality and Tolerance	3.4.1 Architectural and Concrete Finish	Required			
		3.4.2 Product Tolerance	Required			
		3.4.3 Demonstrate in-process repair to finish concrete defect	Required			
3.5	Storage, Protection and Delivery	3.5.1 Procedures for Storage, Protection & Delivery	Documented procedures and implemented			Proper storage & protection
		3.5.2 Minimum Concrete Strength Specified for Demoulding and Lifting	Monitor 1,3,7 and 28 days concrete strength test results			Monitor 28 days concrete strength test results
		3.5.3 Final Inspection & Acceptance of Precast Concrete Products	a) Records of post pour inspection by QA/QC supervisor and client's representative. b) Records of the delivery order of the completed components approved for release by an authorised person.			
3.6	(For group *PPVC only) In process trial assembly of PPVC modules	3.6.1 Method statement (MS) for assembly of PPVC modules	Presentation of the MS and BIM simulation of installation			
		3.6.2 Demonstrate the in-process assembly and the QC checks	Simulate the installation process in the factory for floor-to-floor and the checks for alignment and verticality			

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4 Product Range

4.1	Product Group	Description	Remark
	GS1	<u>Precast Concrete Products (No Pre-stressed Reinforcement):</u> Conventionally reinforced precast concrete elements, including piling, pile caps, sheet panels, retaining wall, planks, floor and roof slabs, joists, stairs, seating members, columns, beams, walls, spandrels, roof water tanks, household shelters and prefabricated bathroom units.	<p>1. Precaster shall declare their main precast concrete product(s) in the application form.</p> <p>2. Product grouping is for easier identification of precaster's product range.</p> <p>3. Accredited precaster shall have their specific product group(s) indicated on the Certificate of Accreditation.</p> <p>4. The accredited category and the specified product group provide a guide specification to all parties for selecting the precaster that suits the particular contract and its project requirements.</p> <p>5. The Precaster Accreditation Scheme does not certify any product conformity and its assessment is on the control processes leading to product quality within acceptable tolerances.</p> <p>6. In-process trial assembly of PPVC modules is required for *PPVC.</p>
	GS2	<u>Pre-stressed Repetitively Produced Products:</u> Precast concrete products that pre-tressed with straight , pre-tensioning, or post-tensioning strands. Included are hollow-core slabs, spun piles, floor, roof and wall construction, that maybe wet cast, machine cast, extruded, or slip formed. Other products include, flat slabs, wall panels, planks and all products in GS1 .	
	GS3	<u>Pre-stressed Structural Products:</u> Precast concrete structural members that are pre-stressed with deflected , pre-tensioning, or post-tensioning strands. Included are stemmed members for roofs, floors, and walls, as well as beams, columns, spandrels, joists, seating members, and all products in GS1 and GS2 .	
	GC1	<u>Bridge, Railway and Roadwork Structural Products:</u> Like box girders, T-shaped or I-shaped segments, undercarriages, road viaduct components, MRT/LRT viaduct components, pedestrian overhead bridge components, rail tunnels segments and linings, ventilation shafts, railway ties/sleepers, and earth retaining structures. Include pre-stressed and post-tensioned components, repetitive produced members and modular units, plus customisation and specialisation with architectural finishes. M&E service maintenance tunnels & ventilation shafts.	
	GC2	<u>Sewerage and Drainage Products:</u> Like manholes, box culverts, box drains, channels ICs, circular pipes, underground tanks, sewerage tunnels, drainage tunnels, sluice channels, coastal protection structures. Include pre-stressed and post-tensioned components, repetitively produced members and modular units.	
	GA	<u>Non-Structural Products:</u> Like internal walls, claddings, sun breakers, refuse chutes, roof slabs, interlocking blocks/pavers, benches, ICs, electrical draw-pits, chamber rings, reinforced concrete covers, U-drains, cable trenches, M&E ducts, noise barriers, road kerbs, drop inlets, utility masts/poles, false columns and masonry blocks.	
	PPVC	<u>PPVC Concrete Module:</u> 3D module that is either assembled from panels or cast as a volumetric component and ready for interior finishing works	

Note 1

- a) Both minimum paid-up capital and net worth shall be met separately.

Note 2

- a) "Professional" shall mean a professional qualification with a recognized degree in Civil & Structural Engineering or equivalent qualifications approved by Professional Engineers Board. Alternatively, Professional Staff must have obtained a degree in Civil & Structural Engineering from universities listed in Building Control Act (Chapter 29), Building Control Regulations: Fourth Schedule.
- b) "Supervisory" shall mean a minimum technical qualification with a polytechnic diploma in Architecture, Building, Civil/ Structural Engineering or a National Certificate in Construction Supervision (NCCS). Alternatively, Supervisory staff must have a minimum of 5 years of working experience in precast concrete works if he does not possess the minimum technical qualification stated. **Supervisory staff shall attend training in precast concrete management, and preferably in the relevant Good Industry Practices (GIP) workshops and relevant courses conducted by BCA Academy, Singapore.**
- c) "Technical" shall mean skilled workers in precast concrete works and have the competency in precast and/or prestressed concrete works. Professional and Supervisory staff shall train the workers in-house and to ensure workers have the competent level of skills and knowledge. Alternatively, the workers shall have certificates (like the BCA Coretrade) from recognized and/or accredited institutions for training in concrete, rebar and formwork or precast concrete and/or prestressed concrete.
- d) **Equivalent qualifications, training and experience for staff in overseas plant/factory** from internationally recognized universities and polytechnics.