

SINGAPORE CONCRETE INSTITUTE**Precaster Accreditation Scheme: Desk Study Checklist**

Precaster Firm : XXX
Date of Assessment : DD/MM/YYYY
Plant Location/Address : XXXXX
Accreditation Grade Category : PC1A/PC1/PC2/PC3*
Accreditation Type : New/Renewal
Product Group(s) : GS1/GS2/GS3/GC1/GC2/GA/PPVC*
Lead Auditor/Auditor : XXX
Observer : Nil/Edina

S/N	Assessment Area	Requirement			Conformity		Comment/ Observation	
					Yes (✓)	No (X)		
1.	Management and Facilities	Top management commitment and the effectiveness of QMS. Plan for the availability of resources for the plant and production.						
1.1	Financial	Audited Financial Report; or Final Closing Accounts.						
1.1.1	Min. Paid-up Capital & Net Worth (to be met separately)	Category	Paid-up Capital (min.)	Net worth	✓		Latest audited financial statements (last 12 months) Audited Date XX Paid up Capital XX Net worth XX	
		PC1A	S\$2 M	-				
		PC1	S\$1 M	≥ S\$1 M				
		PC2	S\$250K	≥ S\$250K				
		PC3	S\$50K	≥ S\$50K				
1.2	Human Resource	Competent staff based on appropriate education, training, skills and experience.						
1.2.1	Professional, Supervisory & Technical staff	Category	a) Professional	b) Supervisory	c) Technical			
		PC1A	3	4	10			
		PC1	2	3	8			
		PC2	1	2	5			
		PC3	0	2	3			
1.2.2	Training	PC1A, PC1, PC2 a) Training programme & recent training records b) At least one supervisor (TWO for PC1A) shall be trained in management and supervision of precast concrete projects in the past 12 months, preferably in the						

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		relevant GIP Workshop and Course conducted by BCA Academy			
		c) In-house training of workers in precast concrete production by QA/QC Supervisor or Engineer			
		PC3 : Training records			

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			Yes (✓)	No (X)																									
1.3	Management Systems	Certification by SAC or UKAS accredited Certification Body.																											
1.3.1	Management System	PC1A & PC1: ISO9001&14001&OHSAS18001# PC2:ISO9001&OHSAS18001# PC3:ISO 9001 <i>#Either valid OHSAS 18001 or SS506 or Bizsafe or ISO45001</i>																											
1.3.2	Quality Plan	PC1A, PC1, PC2 & PC3: Project quality plan																											
1.4	Plant Facilities	Available land, space & equipment for production & storage.																											
1.4.1	Capacity of Plants	a) PC1A: Gross Plot Ratio (GPR) ≥1.4 b) PC1A & PC1: Min. Annual concrete vol. output 45,000m³ OR min. production floor area 15,000m² PC2: Min. Annual concrete vol. output 10,500m³ OR min. production floor area 3,500m² PC3: Min. Annual concrete vol. output 4,500m³ OR min. production floor area 1,500 m² c) PC1A, PC1,PC2,PC3: Monitor & document monthly concrete vol. production output of plant (m³)																											
1.4.2	i) Equipment	a) Scales & Measuring <table border="1"><tr><th>PC1A</th><th>PC1</th><th>PC2</th><th>PC3</th></tr><tr><td colspan="2">Electronic laser device</td><td colspan="2">NA</td></tr><tr><td colspan="4">Measuring tape Spirit level Levelling device</td></tr></table> b) Concrete testing <table border="1"><tr><th>PC1A</th><th>PC1</th><th>PC2</th><th>PC3</th></tr><tr><td colspan="2">Compressive strength test machine</td><td colspan="2">NA</td></tr><tr><td colspan="2">Test cube mould Vibration hammer / table Slump test set</td><td colspan="2">NA</td></tr></table>	PC1A	PC1	PC2	PC3	Electronic laser device		NA		Measuring tape Spirit level Levelling device				PC1A	PC1	PC2	PC3	Compressive strength test machine		NA		Test cube mould Vibration hammer / table Slump test set		NA				
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		c) Lifting <table><tr><th>PC1A</th><th>PC1</th><th>PC2</th><th>PC3</th></tr><tr><td colspan="2">Gantry crane 10T & 16T or 20T</td><td>Gantry crane 10T or 16T</td><td>Gantry crane at least 1 (5T)</td></tr><tr><td colspan="2">Mobile crane</td><td colspan="2">NA</td></tr><tr><td colspan="3">Forklift</td><td>NA</td></tr><tr><td colspan="4">Shackle Lifting wire Lifting chain Lifting belt Lifting frame Lifting clamper</td></tr></table>	PC1A	PC1	PC2	PC3	Gantry crane 10T & 16T or 20T		Gantry crane 10T or 16T	Gantry crane at least 1 (5T)	Mobile crane		NA		Forklift			NA	Shackle Lifting wire Lifting chain Lifting belt Lifting frame Lifting clamper						
PC1A	PC1	PC2	PC3																						
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		d) Formwork <table><tr><th>PC1A</th><th>PC1</th><th>PC2</th><th>PC3</th></tr><tr><td colspan="2">Metal flatbed workstation & appurtenances</td><td colspan="2">NA</td></tr><tr><td colspan="3">Engineered System</td><td>NA</td></tr><tr><td colspan="4">Timber Steel</td></tr></table>	PC1A	PC1	PC2	PC3	Metal flatbed workstation & appurtenances		NA		Engineered System			NA	Timber Steel										
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PC1A	PC1	PC2	PC3																						
Prestressing machine Saw machine Stressing jack			NA^																						
	ii) Calibration	PC1A, PC1, PC2: In load sensors, pressure gauges, moisture meters and data loggers. PC3: Not required																							
1.4.3	Mechanisation PC1, PC2 shall have automation and/or any productive machinery	In Production, Storage & Packaging. PC1A: Must have Pallet Circulation System or Carousel Tunnel Segment and curing chamber PC1, PC2: Either pallet circulation system, robotics, auto concrete spreader, auto-bar bending, vibration table, external vibrator, steel mould forming machines. PC3: Not required																							

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			Yes (✓)	No (X)	
1.4.4	Information Technology(IT)	In communication, documentation and record PC1A & PC1: LAN, Electronic Real-Time Processing System, BIM, Biometric Authentication System (BAS) PC2: LAN, Internet access PC3: Internet access			
2.	Track Record & Production Drawings	Maintain completed projects records & their total contract value for at least 3 years and higher grade precaster shall demonstrate drawing capabilities.			
2.1	Track Record	Traceable and creditable track record.			
2.1.1	Min. Contract Value (CV) for past 3 yrs	PC1A & PC1: CV ≥ S\$30 M** PC2: S\$5 M ≤ CV < S\$30 M PC3: CV < S\$5 M <i>**For PC1A (newly set-up plant):</i> - 1 st year Provisional Certification - 2 nd year \$10Million - 3 rd year \$20Million			
2.2	Shop drawings	Presented in standard drawing format and have a master drawing list. (For overseas plant or outsourced, Precaster shall maintain a drawing control procedure)			
2.2.1	Drawing staff	PC1A: At least 1 BIM Manager 3 staff trained in drawing, 2 staff are BIM-certified PC1: At least 2 staff trained in drawing and 1 staff is to be BIM-certified PC2: At least 1 staff trained in drawing PC3: Not required			
2.2.2	Preparation & Control of Shop drawings	PC1A & PC1: Drawing manual and procedure for control of drawing for production PC2: Procedure for control of drawing for production PC3: Not required			
2.2.3	IT Provisions and Equipment	PC1A: BIM ready or compatible drawing software in at least 3 nos. desktop computers			

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		PC1: BIM ready or compatible drawing software in at least 2 nos. desktop computers			
		PC2: Drawing software (Autocad) in at least 1 desktop computer			
		PC3: Not required			

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			Yes (✓)	No (X)	
3.	Quality Control In Production	Conformance to standard requirements and performance in quality.			
3.1	Raw Material	Conform to current SS EN standards for material specification and testing.			
3.1.1	Concrete	PC1A, PC1,PC2,PC3: Approved concrete mix design			
3.1.2	Cement	PC1A, PC1,PC2,PC3: Maintain cement tests records			
3.1.3	Sand	Approved supplier PC1A, PC1, PC2: Maintain sieve analysis & gradation records PC3 : Not required			
3.1.4	Aggregate	PC1A, PC1,PC2: Approved supplier Maintain test records PC3: Not required			
3.1.5	Admixture	PC1A, PC1, PC2: Maintain admixtures' specifications and tests records PC3: Not required			
3.1.6	Reinforcing Steel Bar	PC1A, PC1, PC2, PC3: Approved supplier, Maintain mill certificates, heat numbers & tensile test records			
3.1.7	Pre-stressing steel	PC1A, PC1,PC2 <u>in GS2,GS3&GC1</u> Approved supplier, Maintain mill certificates, heat numbers & roll numbers records PC3: Not required^ ^Applicable to Pre-stressing Product group GS2,GS3&GC1			
3.1.8	Miscellaneous Materials e.g. metal inserts, lifting devices, packers, embedded steel	PC1A, PC1, PC2: Approved supplier. Maintain test records of lifting devices, records of mill certificates & heat numbers for metal plates, inserts and any galvanising certificates for corrosion protection PC3: Not required			
3.2	Concrete Mix Supply	In-house RMC batching plant shall be certified to quality standards. (If external RMC batching plant, the quality control records shall be maintained)			
3.2.1	Certification of Batching Plant For overseas plant, it shall be certified to ISO 9001:2015 and RMC specified to EN206-1:2014	PC1A, PC1, PC2: In Singapore and(Johor), RMC used for precast components shall be certified by SAC accredited CBs to SS EN 206-1:2014, SS 544-1:2014, SS 544-2:2014 PC3: Not required			

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			Yes (✓)	No (X)	
3.2	Concrete Mix Supply	In-house RMC batching plant shall be certified to quality standards. (If <u>external</u> RMC batching plant, the quality control records shall be maintained)			
3.2.2	Storage and Handling of Aggregates If external RMC batching plant, maintain records from the approved supplier	a) PC1A: Fully enclosed storage for fine and coarse aggregates PC1, PC2: Sheltered or covered to prevent exposure to weather and separate fine & coarse aggregates PC3: Not required			
		b) PC1A, PC1,PC2: Proper separation to prevent inter-mingling PC3: Not required			
		c) PC1A, PC1,PC2: Maintenance of machinery, equipment & tools PC3: Not required			
3.2.3	Concrete Testing	a) PC1A, PC1,PC2,PC3: Test by SAC-SINGLAS accredited laboratory or an ILAC-MRA partner			
		b) PC1A, PC1: In-house laboratory facility have tests procedures and calibration certificates for gauges & sensors of equipment PC2, PC3: Not required			
		c) PC1A, PC1,PC2,PC3: Record of Concrete test cubes compressive strength test reports			
3.3	Production	Production planning, scheduling and management.			
3.3.1	Operation Control	PC1A, PC1,PC2: Documented Quality Plan and QA/QC procedures PC3: According to approved method statement			
3.3.2	Inspection & Test Plan (ITP)	PC1A, PC1: Documented ITP for Production and ITP for Batching Plant PC2: Documented ITP for Production PC3: Maintain test records of concrete, reinforcing steel and other materials or products test records			

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3.4	Product Quality and Tolerance	Documented quality control procedures shall be maintained at the plant.			
3.4.1	Architectural and Concrete Finish	PC1A, PC1,PC2,PC3: a) No glaring surface defects			
		c) Approved method statements of repairs			
		c) Demonstrate in-process repair to concrete defect			
3.4.2	Product Tolerance Verify min. 2 samples, either rebar/formwork or finished component	In general, they shall comply to the allowable tolerances:			
		(a) Dimension			
		(b) Alignment, plumb and level			
		(c) Exposed Surface			
		(d) Lifting points/inserts			
		(e) Blockouts			
		(f) Sleeve system/connections	NA		
		(g) Interface requirements			
		(h) Joint rebar/formwork			
		(i) Cast-in-steel items	NA		
		(j) Bolted/welded connections	NA		
3.5	Storage, Protection and Delivery	Pre-production planning for storage and delivery. Careful storage & protection to prevent damages. Safety at all times before, during and after delivery.			
3.5.1	Procedures for Storage, Protection & Delivery	PC1A, PC1, PC2: Documented procedures and implemented PC3: Proper storage and protection required			
3.5.2	Min. Concrete Strength Specified for De-moulding & Lifting	a) PC1A, PC1, PC2, PC3: For de-moulding, concrete test cubes compressive strength results shall determine if the minimum strength is achieved			
		b) PC1A, PC1, PC2: Monitor 1, 3, 7 and 28 days concrete strength test results PC3: Monitor 28 days concrete strength test results			

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3.5.3	Final Inspection & Acceptance of Precast Concrete Products	PC1A, PC1, PC2, PC3: a) Records of post pour inspection by QA/QC supervisor or client's representative. b) Records of the delivery order of the completed components approved for release by a responsible 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			
		3.6.2 Demonstrate the in-process assembly and the QC checks			

*S/N 4 in next page

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4	Product Range	Product(s) Identification and Product Group(s) Verification.	
4.1	Description of Product Group	Tick(✓) group	Briefly state the plant's main products
GS1	Precast Concrete Products (No Prestressed Reinforcement): Conventionally reinforced precast concrete elements, including piles, sheet panels, pile caps, retaining wall elements, planks, floor and roof slabs, joists, stairs, seating members, columns, beams, walls, spandrels, roof water tanks, household shelters, prefabricated bathroom units.		
GS2	Pre-stressed Repetitively Produced Products: Precast concrete products that pre-stressed with <i>straight</i> , pre-tensioning, or post-tensioning strands. Included are hollow-core slabs, spun piles, other floor, roof and wall construction, that maybe wet cast, machine cast, extruded, or slip formed. Other products include, flat slabs, wall panels, planks and <i>all products in GS1</i> .		
GS3	Pre-stressed Structural Products: Precast concrete structural members that are pre-stressed with <i>deflected</i> , 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 <i>all products in GS1 and GS2</i> .		
GC1	Bridge, Railway and Roadwork Structural Products: Like box girder, T-shaped or I-shaped segments, undercarriages, road viaduct components, MRT/LRT viaduct components, pedestrian overhead bridge components, rail tunnel segments and 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	Sewerage and Drainage Products: Like manholes, box culverts, box drains, channels, circular pipes, underground tanks, sewerage tunnels, drainage tunnels, sluice channels, caissons, reservoirs, coastal protection structures. Include pre-stressed and post-tensioned components, repetitive produced members and modular units.		
GA	Non-Structural Products: Like internal partition wall, cladding, sun breaker, parapet wall, refuse chute, roofing tiles, lintol, interlocking block/paver, IC, electrical draw-pits, chamber rings, r.c covers, U-drains, cable trenches, M&E service ducts, noise barriers, road kerbs, drop inlets, utility masts/poles and masonry blocks.		
*PPVC	PPVC Concrete Module: 5 or 6 sided volumetric cast concrete body, U-shaped concrete body cast with precast panel walls, N-shaped concrete body cast with concrete slab		