BIM, A Critical Criteria

on a PSSCOC contract

People's Association
Tampines Town Hub

SCPW 2014

Outline

part 1 | PSSCOC

part 2 | The Project

part 3 | Critical Criteria

part 4 | PQM

part 5 | BIM Specification

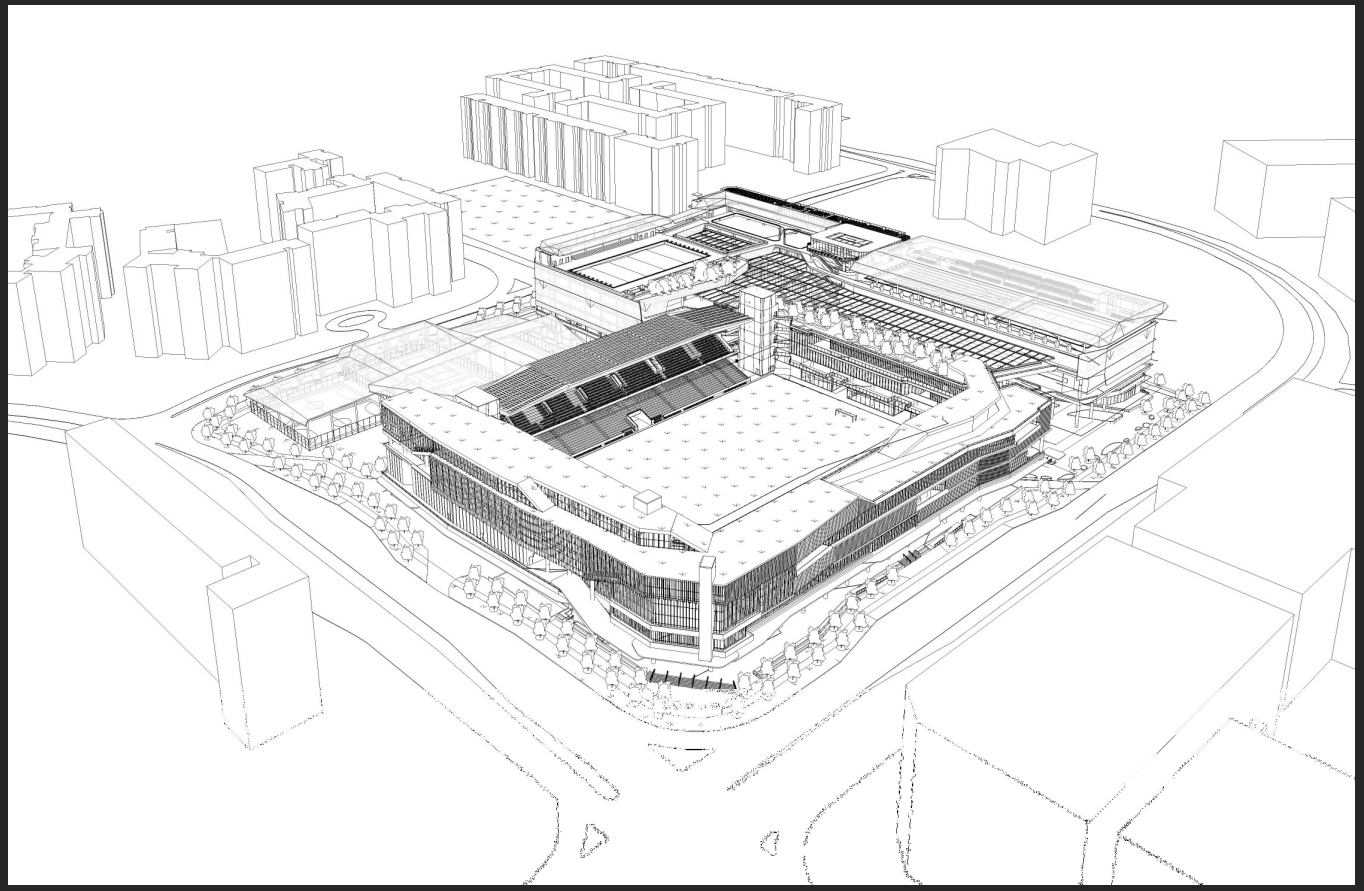
part 1

PSSCOC

PSSCOC

public sector standard conditions of contract

A common contract form for all public sector construction projects.



part 2

The Project

TAMPINES TOWN HUB

BIM, A CRITICAL CRITERIA

DPA DP ARCHITECTS

Tampines Town Hub

- Ave 4 + Ave 5; Tampines Stadium
- Community Building
- Concurrent DTL3 construction

Project Team

Many Stakeholders

Stakeholders

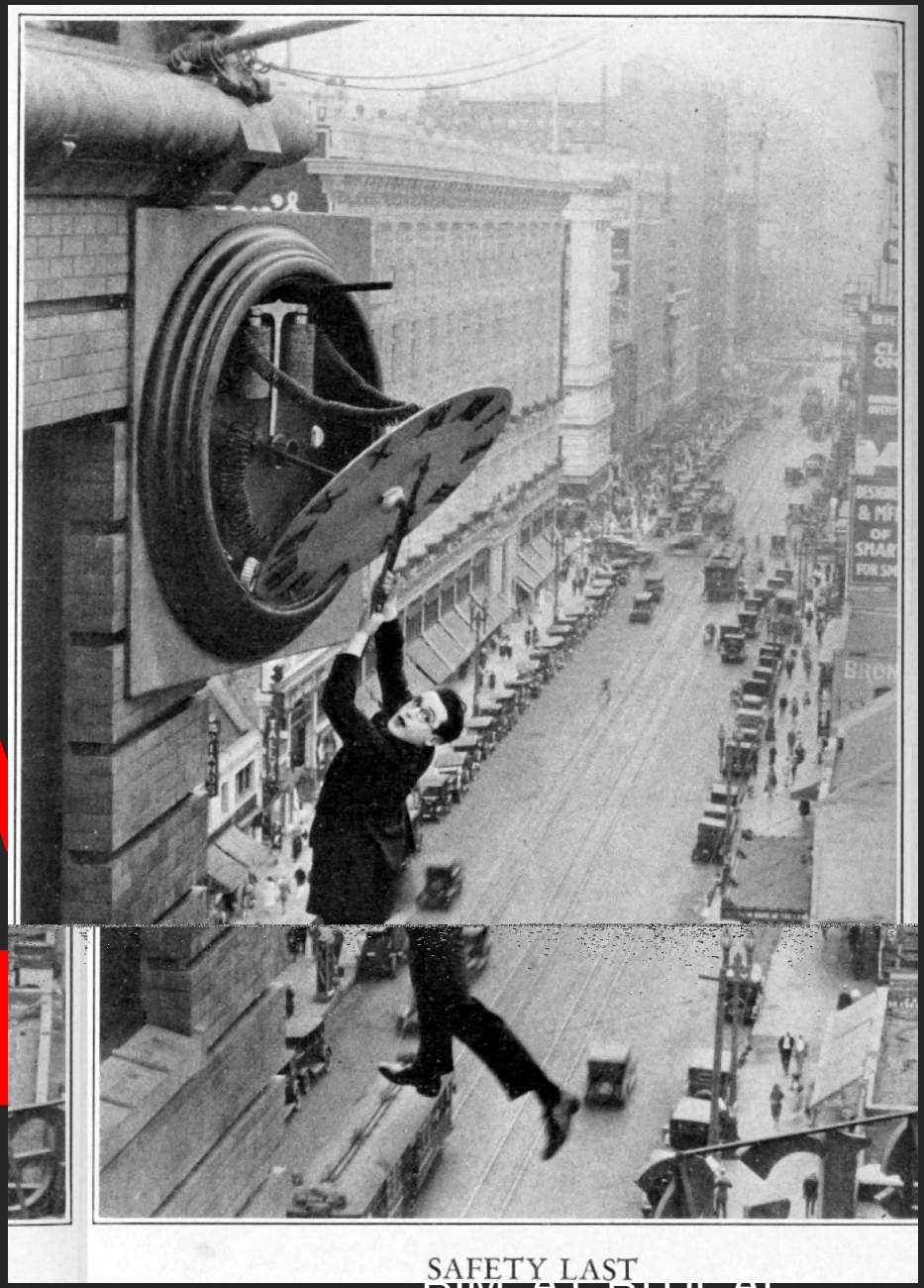
People's Association

ARCADIS

- DPA
- DPD
- Tylin
- Aecom
- DLKPK

part 3

CRITICA
CRITERI



TAMPINES TOWN HUB

BIM, A CRITICAL
CRITERIA

DPA
DP ARCHITECTS

Critical Criteria

checklist

6/7 STOREY CIVIC & COMMUNITY/SPORTS & RECREATION DEVELOPMENT AT TAMPINES

MAIN CONTRACT

Doc B.5: Tender Submittals Checklist and Declaration of Compliance with Tender Documents and Drawings

Critical Criteria & PQM Evaluation

1.0	bizSAFE certificate	☐
2.0	Statement of Profit and Loss Account and Balance Sheet for the last 3 years (2012, 2011 and 2010) certified by Auditors	☐
3.0	CONQUAS project listing as obtained from BCA IQuas website (http://www.corenet.gov.sg/iquas/)	☐
4.0	BIM Proficiency Matrix	☐
5.0	Preliminary Construction BEP	☐
6.0	CV of proposed personnel for:-	
	▪ Project Manager	☐
	▪ Assistant Project Manager	☐
	▪ BIM Manager	☐
	▪ BIM Coordinators (3 person)	☐

Critical Criteria

who is eligible to tender

5. The Tenderer shall not be under Man Year Entitlement (MYE) Freeze under MOM's Safety Demerit Scheme for any of their individual worksite	MOM's List of Contractors with Demerit Points	Not Required
6. The Tenderer must have project experience (within past 10 years) for ALL of the following criteria:- a. Carried out and completed projects with contract value of S$60 million and above. b. Carried out and completed 1 or more projects within MRT reserves (1st or 2nd) c. Carried out and completed 1 or more projects with long span structure (>40m) d. Carried out and completed 1 or more Institutional / Commercial / Sports / Recreational Buildings projects. e. Carried out and completed 1 or more projects with BIM.	Contractor's submission	Table 1 with format as shown in page 20 & Relevant supporting documents illustrating project experience fulfilling criteria 6.a. to 6.e.

critical criteria

the escape clause

Note to Critical Criteria No. 6 – Track Record:-

In the event that Contractor has no direct relevant track records, Contractor is allowed to use any of the following:

i. Contractor has undertaken past projects of some degree of similarity in terms of complexity which need not be of the same development type or size; or

ii. Contractor engages specialist sub-contractors who had undertaken past projects of similar complexity. No joint-venture with the specialist sub-contractors is required so long as there is binding commitment to use the specialist sub-contractors upon award of the tender; or

iii. Contractor engages personnel with relevant experience that meets the criterion.

Contractor is to submit a detailed write up of the approach they are taking to meet this critical criterion and submit all relevant supporting documents.

critical criteria

submittal requirements

BIM Competency (12 Points)

Tenderer shall complete the BIM Proficiency Matrix as illustrated in Page 8-13 of this document which is also provided in Microsoft Excel format for Tenderer to fill into. Tenderer shall submit the BIM Proficiency Matrix in the original Microsoft Excel file for soft copy submission and also print out for hard copy submission.

Tenderer shall submit a Preliminary Construction BEP, outlining the strategy and schedule for utilizing BIM to execute construction related activities and project coordination integrated into the Master Programme. The Construction BEP shall include but not limited to the following:-

i. BIM strategy within Master Programme to meet milestones, deliverables, costing
ii. Model Accuracy
iii. BIM Methodology
iv. Location Accuracy
v. Construction Data
vi. As-built Modeling

In addition, Tenderer shall propose in their Preliminary Construction BEP, methodology for utilising BIM to benefit the Monthly Progress Claims, Variation Order and Final Account valuation process.

The Preliminary Construction BEP should be limited to no more than 8 pages of A4 size sheets in size 11 Arial font, single line spacing, single-sided page.

Tenderer to submit CVs of their proposed BIM related personnel, including but not limited to a BIM manager and minimum 3 BIM Coordinators, clearly indicating their qualifications and experience in BIM.

part 4

PQM – quality criteria & evaluation

PQM

quality ratio

- Clause from BCA PQM guidelines

METHODOLOGY FOR PQM

Price-Quality Weightage and Quality Attributes

3. The weightage between price and quality will range from 60:40 to 80:20, depending on the complexity of the project. For design-bid-build projects, since majority of the design by consultants has been done and the technical specifications have been specified, agencies shall adopt price-quality weightage of 80:20 except for special circumstances. For design and build projects, agencies can consider price-quality weightage of between 60:40 to 70:30.

quality criteria

basis of assessment

6/7 STOREY CIVIC & COMMUNITY/SPORTS & RECREATION DEVELOPMENT AT TAMPINES

Tender Addendum No. 4

MAIN CONTRACT

Doc C.2: Price Quality Method Evaluation

QUALITY CRITERIA (Cont'd)

The following sets out the Quality Criteria that make up the 100 points Total Quality Points. (Cont'd)

Item	Quality Criteria	Benchmarking Evaluation	Points Allocated	Source of Information
5.	**BIM Competency (12 Points)** Based on technical proposal of the submitted:- ▪ BIM Proficiency Matrix ▪ Preliminary Construction BEP ▪ CV of BIM related personnel	Ranking Method (based on 5 best proposal)		Tenderer's submission completed BIM Proficiency Matrix. Tenderers to submit their proposed Preliminary Construction BEP and CV of BIM related personnel.
		Rank 1st	12	
		Rank 2nd	9	
		Rank 3rd	7	
		Rank 4th	5	
		Rank 5th	3	
		Rank 6th and below	0	

BIM Proficiency Matrix

form for tenderers

6/7 STOREY CIVIC & COMMUNITY/SPORTS & RECREATION DEVELOPMENT AT TAMPINES
MAIN CONTRACT

Doc C.2: Price Quality Method Evaluation

TTH Contractor BIM Proficiency Matrix

Category Number	A - Model Accuracy		B - BIM Methodology		C - Location Accuracy		D - Construction Data		E - As-Built Modeling	
1	Basic Model Geometry	A.1	Construction BIM Execution Plan	B.1	Site Orientation	C.1	Quantity Takeoffs	D.1	Post Bid Model Documentation	E.1
	Point Achieved	0	Point Achieved	0	Point Achieved	0	Point Achieved	0	Point Achieved	0
2	Model Based Drawings	A.2	Constructability Analysis	B.2	Existing Environment Awareness	C.2	Object Scheduling	D.2	Coordination Modeling	E.2
	Point Achieved	0	Point Achieved	0	Point Achieved	0	Point Achieved	0	Point Achieved	0
3	Collision Detection	A.3	Model Managers Role Defined	B.3	Global Accuracy	C.3	Material Procurement / Fabrication	D.3	Recapturing Design Intent	E.3
	Point Achieved	0	Point Achieved	0	Point Achieved	0	Point Achieved	0	Point Achieved	0
4	Model Accuracy Innovation	A.4	BIM Methodology Innovation	B.4	Location Innovation	C.4	Construction Innovation	D.4	As-Built Innovation	E.4
	Point Achieved	0	Point Achieved	0	Point Achieved	0	Point Achieved	0	Point Achieved	0

BIM Maturity

Category	Points Achieved	BIM Maturity Score	BIM Standard		
A - Model Accuracy	0	0	BIM Score Between 0-5	=	BIM Startup
B - BIM Methodology	0		BIM Score Between 6-10	=	BIM Ready
C - Location Accuracy	0		BIM Score Between 10-15	=	BIM Capable
D - Construction Data	0		BIM Score Between 16-20	=	BIM Proficient
E - As-Built Modeling	0				

BIM Proficiency Matrix

model accuracy

6/7 STOREY CIVIC & COMMUNITY/SPORTS & RECREATION DEVELOPMENT AT TAMPINES MAIN CONTRACT

Doc C.2: Price Quality Method Evaluation

A - Model Accuracy			Examples	Illustration
A.1 Pt Earned 0	Basic Model Geometry Project Name: Size: Cost: Description:		Project "A" was completed using BIM software. The Architectural model was created with all of the walls, roofs, floors, windows, and doors as model components. The majority of the components used were out of the box, default components.	
A.2 Pt Earned 0	Model Based Drawings Project Name: Size: Cost: Description:		Project "C" used doors that had invisible solids that were based on the building codes that returned collisions when objects touched the invisible solids within the door.	
A.3 Pt Earned 0	Collision Detection Project Name: Size: Cost: Description:		Project "A" had scheduled collision reports run against the architectural, structural, and MEP models. These collision reports were then addressed at the next project meeting and removed or fixed within the model.	
A.4 Pt Earned 0	Model Accuracy Innovation Project Name: Size: Cost: Description:			

BIM Proficiency Matrix

BIM methodology

6/7 STOREY CIVIC & COMMUNITY/SPORTS & RECREATION DEVELOPMENT AT TAMPINES MAIN CONTRACT

Doc C.2: Price Quality Method Evaluation

B - BIM Methodology			Examples	Illustration
B.1 Pt Earned 0	Construction BIM Execution Plan Project Name: Size: Cost: Description:		Project "A" used a plan that was developed by the project team that showed how information was being shared and at what time of the project it was to be shared. It also defined the level of development for each of the objects within the different models.	
B.2 Pt Earned 0	Constructability Analysis Project Name: Size: Cost: Description:		Project "A" included a Structural and MEP model that allowed for the integrated design of the project. The models were used to coordinate information between disciplines.	
B.3 Pt Earned 0	Model Managers Role Defined Project Name: Size: Cost: Description:		Project "A" has all members of the design team assigning a model manager to the project. This role is the single point of contact for all model issues, whether validation of information, transfer of information, or support.	
B.4 Pt Earned 0	BIM Methodology Innovation Project Name: Size: Cost: Description:			

BIM Proficiency Matrix

location accuracy

6/7 STOREY CIVIC & COMMUNITY/SPORTS & RECREATION DEVELOPMENT AT TAMPINES
MAIN CONTRACT

Doc C.2: Price Quality Method Evaluation

C - Location Accuracy			Examples	Illustration
C.1 Pt Earned 0	Site Orientation Project Name: Size: Cost: Description:		Project "A"'s model was generated on top of a civil survey that conveyed the proper location of the site. It also had defined project north and actual north layouts within the project.	
C.2 Pt Earned 0	Existing Environment Project Name: Size: Cost: Description:		Project "A" had all of the existing topographical information modeled.	
C.3 Pt Earned 0	Global Accuracy Project Name: Size: Cost: Description:		Project "A" had the proper latitude, longitude, and altitude defined within the architectural model. The coordinates of the model were then shared within all other models that were created from it. The coordinates of the model are also able to be shared outside of the design software with software such as energy modeling software.	
C.4 Pt Earned 0	Location Innovation Project Name: Size: Cost: Description:			

BIM Proficiency Matrix

construction data

6/7 STOREY CIVIC & COMMUNITY/SPORTS & RECREATION DEVELOPMENT AT TAMPINES
MAIN CONTRACT

Doc C.2: Price Quality Method Evaluation

D - Construction Data			Examples	Illustration
D.1 Pt Earned 0	Quantity Takeoffs Project Name: Size: Cost: Description:		Project "A"'s model was used to provide accurate model data for quantity takeoff. The numbers were used to produce estimates at different phases of the project. The final cost estimate was proven after bid to be within .2% accurate of the quantities.	
D.2 Pt Earned 0	Object Scheduling Project Name: Size: Cost: Description:		Project "B" has schedules directly within the model that show quantities of objects and materials. Those schedules were exported using IFC standards and brought into construction estimating software for inclusion with the construction estimate.	
D.3 Pt Earned 0	Material Procurement / Fabrication Project Name: Size: Cost: Description:		Project "C" had structural steel that was directly ordered from the structural model in conjunction with the architectural model. Mechanical ductwork was also ordered directly from the model using a 3D CAD format as a transfer medium.	
D.4 Pt Earned 0	Construction Innovation Project Name: Size: Cost: Description:			

BIM Proficiency Matrix

as-built modeling

6/7 STOREY CIVIC & COMMUNITY/SPORTS & RECREATION DEVELOPMENT AT TAMPINES MAIN CONTRACT

Doc C.2: Price Quality Method Evaluation

E - As-Built Modeling			Examples	Illustration
E.1 Pt Earned 0	Post Bid Model Documentation Project Name: Size: Cost: Description		Project "A" has all of the post bid documentation existing within the model file itself. All RFI's and addenda were generated from the model.	
E.2 Pt Earned 0	Coordination Modeling Project Name: Size: Cost:		Project "B" was used to generate the coordination models for the different trades. The coordination models along with the design models were used in the field for coordination and job meetings.	
E.3 Pt Earned 0	Recapturing Design Intent Project Name: Size: Cost: Description:		Project "B" from the above example then had the changes from the coordination models placed back into the design models for the architectural, structural, and MEP models. The design models were then checked for accuracy in calculations and sizing.	
E.4 Pt Earned 0	As-Built Innovation Project Name: Size: Cost: Description:			

Evaluation
accessing BIM submissions

			Tenderer	Tenderer A	Tenderer B	Tenderer C
			Total Score	58.99	82.22	67.56
	Percentage		RANK	3	1	2
	100.00	Target Evaluation	Quality Points	7	12	9
BIM Proficiency Matrix				10.5	9.75	12.25
				BIM Capable	BIM Ready	BIM Capable
	25.00	20	TOTAL	13.13	12.19	15.31
Preliminary BEP	Format Compliance			8	7	8
	5	8	Score	5.00	5.00	5.00
	BIM Goals			6	6	7
	5	7	Score	4.29	4.29	5.00
	Platform			2	3	3
	5	3	Score	3.33	5.00	5.00
	Methodology			1.5	1.5	1.5
	5	2	Score	3.75	3.75	3.75
	QAQC			1	1	1
	5	1	Score	5.00	5.00	5.00
	AS-Built			0.5	1	1
	5	1	Score	2.50	5.00	5.00
	30.00		TOTAL	23.87	28.04	28.75
BIM CVs	BIM Manager			0.5	1	0.5
	6	1	Score	3.00	6.00	3.00
	BIM AR Coordinator			0.5	1	1
	3	1	Score	1.50	3.00	3.00
	BIM ST Coordinator			0	1	0
	3	1	Score	0.00	3.00	0.00
	BIM ME Coordinator			0	0	0
	3	1	Score	0.00	0.00	0.00
	15.00		TOTAL	4.50	12.00	6.00
Team's Relevant Experience	Projects			0.5	1	0.5
	5	1	Score	2.50	5.00	2.50
	CVs			0.5	1	0.5
	5	1	Score	2.50	5.00	2.50
	Inhouse			1	1	1
	5	1	Score	5.00	5.00	5.00
	15.00		TOTAL	10.00	15.00	10.00
Holistic	Holistic Approach			0.5	1	0.5
	15	1	Score	7.50	15.00	7.50
	15.00		TOTAL	7.50	15.00	7.50

BIM Competency

ranking and points

S/N	QUALITY CRITERIA	POINTS ALLOCATED	EVALUATION SOURCE		TENDERER A	TENDERER B	TENDERER C
5	**BIM Competency** Based on technical proposal of the submitted: - BIM Proficiency Matrix; Preliminary Construction BEP; and CV of BIM related personnel			Ranking	3	1	2
	Ranking Method (based on 5 best proposal)		Tenderer's submission completed BIM Proficiency Matrix. Tenderers to submit their proposed Preliminary Construction BEP and CV of BIM related personnel.	Points achieved	7	12	9
	Rank 1st	12					
	Rank 2nd	9					
	Rank 3rd	7					
	Rank 4th	5					
	Rank 5th	3					
	Rank 6th and below	0					

quality criteria

report and evaluation sign off

- Sign off from Evaluation committee and Stakeholders

part 5

BIM Specification

Tender Specification

BIM Project Requirements

- SECTION 01 33 10
- BUILDING INFORMATION MODELING (BIM) PROJECT REQUIREMENTS

part 6

tender timeline

tender timeline

31 Jul 13
Tender Calling

1 Nov 13
Tender Closing

22 Nov 13
Conclude Quality Evaluation /
Open Price Envelope

VE

26 Dec 13
Tender Calling
(Round 2)

28 Feb 14
Tender Closing
(Round 2)

4 Mar 14
Conclude Quality Evaluation /
Open Price Envelope
(Round 2)

9 month process

22 Apr 14
LOA issued

7 May 14
Contract Commencement

tender timeline

31 Jul 13
Tender Calling

5 Tender Addenda

12 Replies to Tender Queries

VE

3 Post Tender Addenda

5 Replies to Post Tender Queries

9 Post Tender Clarifications

9 month process

4 Tender Interviews

22 Apr 14
LOA issued
7 May 14
Contract Commencement

End part

Closing

Closing

- Time, $$$ and accountability
- To get qualified Contractors
- Clear and published Quality Criteria
- Avoid subjective/vague parameters
- Assessment only from submissions
- Useful tender interviews and PTC

Questions and Answers

Wong Hao Jan | WongHaoJan@dpa.com.sg
Senior Associate (Technical), DP Architects