BRIEFING ON REVISED PQMV2 FRAMEWORK AND THE 2ND CONSTRUCTION PRODUCTIVITY ROADMAP

17 Nov 2015
2nd Construction Productivity Roadmap

We shape a safe, high quality, sustainable and friendly built environment.
Vision & Target of Productivity Improvement

VISION
To build a highly integrated & technologically advanced construction sector led by progressive firms & supported by a skilled and competent workforce by 2020.

Target
Average of 2% – 3% per annum till 2020
Strategies under 1st Construction Productivity Roadmap

1. Regulate demand and supply of low cost foreign workforce
2. Enhance quality of construction workforce
3. Impose regulatory requirements & setting minimum mandatory standards
4. Incentivise firms to adopt technology, develop manpower & build capability

Industry Outreach Efforts
Progress under 1\textsuperscript{st} Construction Productivity Roadmap

**Improvement in Site Productivity**
*(Floor area completed per manday)*

**Achievement**
(from 2010 – 2014)

1.4%  

**Improvement in Site Productivity**
*(building works)*

<table>
<thead>
<tr>
<th>Year</th>
<th>m² per manday</th>
<th>Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>0.380</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>0.381</td>
<td>0.2%</td>
</tr>
<tr>
<td>2011</td>
<td>0.384</td>
<td>0.8%</td>
</tr>
<tr>
<td>2012</td>
<td>0.389</td>
<td>1.3%</td>
</tr>
<tr>
<td>2013</td>
<td>0.395</td>
<td>1.5%</td>
</tr>
<tr>
<td>2014*</td>
<td>0.403</td>
<td>2.0%</td>
</tr>
</tbody>
</table>
Progress under 1st Construction Productivity Roadmap

Improvement in adoption rate of key productive technologies

CPCF Take-Up

Total committed as of end May 2015:
> $300 million

Benefitted over 6,000 firms
(> 90% are smaller firms)

2nd Roadmap endorsed
Approved funding of $450mil over next 3 years

Incl curtain wall, cladding, glass, precast wall, drywall

Drywall (residential)

System Formwork

Prefab Level - Structural System

Prefab Level - Wall System

CPCF – Construction Productivity & Capability Fund
2nd Construction Productivity Roadmap Focus Areas

**Targets:**
Annual average of 2-3% productivity improvement by 2020

3 focus areas

- Higher quality workforce

Singapore
- Inexperienced transient foreign workers waiting for instructions

Japan / Korea
- Experienced workers working with minimal supervision
2nd Construction Productivity Roadmap Focus Areas

**Targets:**
Annual **average of 2-3%** productivity improvement by **2020**

- Higher capital investment
- Technology adoption on site
- Manufactured off-site & installed on-site i.e. **Design for Manufacturing & Assembly (DfMA)**

- System formwork
- Scissor lift
- Prefab Factory
- PPVC
2nd Construction Productivity Roadmap Focus Areas

**Targets:**
Annual average of 2-3% productivity improvement by 2020

3 focus areas

Better integration of value chain

Developers | Consultants | Main contractors | Specialist contractors | Facility managers

- Project parties working in silo using paper blueprints
- Building Information Modelling (BIM) as key enabling technology
- Close collaboration through VDC and Big Room concept
Desired Workforce Profile

- **Strong PMET Core** to lead the sector
- At least 40% **R1** by 2020
- **Overall manpower savings**
- **20-30% manpower savings**

**Higher quality workforce**
4 Initiatives to Raise Workforce Quality

1. **Build Up R1 Workers**
   - mandatory upgrading, minimum R1 % at firm level, direct pathway for R1 entry

2. **Adjust Levy Rates**
   - to encourage upgrading and retention

3. **Workforce Training and Upgrading (WTU) Scheme**

4. **Scholarships & Sponsorships**

Higher quality workforce
Impose Upgrading Requirements

**A** Upgrading Phase

- 1 Jan 15
- Upgrade 5%
- 1 Jan 16
- Upgrade 5%

**B** Minimum R1% requirement

- 1 Jan 17 onwards
- At least 10% of firm’s WPHs must be R1

Transition to help firms to build up to min R1% in 2017

Higher quality workforce
## Upgrading Pathways

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Existing Pathways</th>
<th>New Pathway</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(A) CoreTrade / Multiskilling</td>
<td>(C) Direct R1</td>
</tr>
<tr>
<td>Experience</td>
<td>Min 4 years</td>
<td>X</td>
</tr>
<tr>
<td>Skills Assessment (Test)</td>
<td>Pass</td>
<td>Pass</td>
</tr>
<tr>
<td>Minimum Fixed salary(^1)</td>
<td>X</td>
<td>$1,600</td>
</tr>
</tbody>
</table>

\(^1\) Fixed monthly salary means the sum of basic monthly salary and fixed monthly allowances.

Note 2: Direct R1 pathway will start from 1st Sept 2015

Higher quality workforce
## Adjust Levy Rates

### Widen Levy Differential

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R1</td>
<td>R2</td>
<td>R1</td>
<td>R2</td>
</tr>
<tr>
<td><strong>MYE Quota</strong></td>
<td>$300</td>
<td>$550</td>
<td>$300</td>
<td>$550</td>
</tr>
<tr>
<td><strong>MYE Waiver</strong></td>
<td>$700</td>
<td>$950</td>
<td><strong>$600</strong></td>
<td>$950</td>
</tr>
</tbody>
</table>

- **Adjusted levy rates**: Widened R1/R2 to $250
- **Adjusting levy rates till 2017**: Widening R1/R2 to $400

**Higher quality workforce**
Incentivise upgrading through co-funding

**1st Roadmap**

Co-funds (up to 80%)
A. Core Trade Registration (training & skills assessment)
B. 2nd Certificate under Multi-skilling Scheme
C. Other higher value-adding qualifications at supervisory levels

Co-funds (up to 70%)
D. Selected Professional Managerial Executive and Technical Personnel (PMET) courses

**2nd Roadmap**

- Co-funds *more training courses* at the PMET level
- Co-funds up to 90% for locals
- Co-funds up to 40% for first time failure of experienced foreign workers in 2015 and 2016

*Supported over 6,000 firms, among which more than 90% are smaller firms*

Higher quality workforce
4 Scholarships & Sponsorships

Building up local core

University
- Undergraduate Scholarship (Full-Time)
- Undergraduate Sponsorship (Full-Time)
- Undergraduate Scholarship (Part-Time)
- Undergraduate Sponsorship (Part-Time)

Poly / BCAA
- Diploma Scholarship (Full-Time)
- Diploma Sponsorship (Full-Time)
- Diploma Scholarship (Part-Time)
- Diploma Sponsorship (Part-Time)
- ITE Scholarship (Full-Time)
- ITE Scholarship (Part-Time)

ITE / Job-seekers
- ITE Stage 2
- ITE Stage 2 (Enhanced)
- ITE Scholarship (Full-Time)
- ITE Scholarship (Part-Time)

A-level & Poly
- Academic pathway

O & N-level
- Competency pathway

ITE
- Academic pathway (part-time)

In-service Personnel
- New

Bldg Specialist Sponsorship
- (Supervisor)
- (Foreman)

Postgrad Sponsorship
- (Part-Time)

Bldg Specialist Sponsorship
- (Supervisor)
- (Foreman)

New
- ITE Scholarship (Full-Time)
- ITE Scholarship (Part-Time)

PME
- Supervisory
- TAP
- Junior Supervisory & Foreman
Driving Higher Capital Investments

Two-Pronged Approach

Public Sector take the lead

1. **Individual Productivity Roadmaps** for Government Agencies

2. **Productivity Gateway Framework**

3. **Tendering advantage** for productive firms

4. **GLS/IGLS** productivity requirements

Incentivise private sector adoption

5. **CPCF 2nd Tranche** – **Funding Support**
   - Wider adoption of **DfMA**
   - Boosting *on-site* productivity

Higher capital investments
Individual Productivity Roadmaps for Government Agencies

Take the lead in meeting national productivity targets

Adopt game-changing technology where feasible

Higher capital investments

Productivity Improvement is a KPI
Productivity Gateway Framework

2 Public Sector take the lead

Development Type level

Project Level

Monitoring

Master Productivity Plan (MPP)

Productive Technology Adoption

BIM Co-ordination and Integration Approach

Productive Management & Procurement Practices

MPP as blueprint

Project 1
Project 1 Productivity Plan (P3)

Project 2
Project 2 Productivity Plan (P3)

Project N
Project N Productivity Plan (P3)

Regular updates to Chairman, NPC by BCA on GPEs’ PG projects
To incentivise consultants & contractors to be more productive
Tendering advantage for submissions by progressive consultants/contractors
To incentivise consultants & contractors to be more productive
Tendering advantage for submissions by progressive consultants/contractors

<table>
<thead>
<tr>
<th>Current QFM</th>
<th>QFMv2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(procurement of consultancy services)</td>
<td>(implemented since 1 Sep 2014)</td>
</tr>
<tr>
<td>Productivity Component</td>
<td>9% – 12%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current PQM</th>
<th>PQMv2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(procurement of construction services)</td>
<td>(with effect from 1 Jan 2016)</td>
</tr>
<tr>
<td>Productivity Component</td>
<td>3% – 6%</td>
</tr>
</tbody>
</table>

Higher capital investments
iGLS/GLS Requirements

Public Sector take the lead

West Coast Vale

Residential

Higher capital investments
iGLS/GLS Requirements

4 Public Sector take the lead

Yishun Ave 4
Commercial / Residential

Jurong West St 41 (Parcel B)
Residential

Higher capital investments
iGLS/GLS Requirements

Clementi Ave 1
Residential

Higher capital investments
Funding Technology Adoption

5. Incentivise Private Sector Adoption

Existing schemes will continue to be funded in 2nd CPCF Tranche

- Co-fund site mechanisation through purchase & lease of equipment
- Co-fund up to 70% of cost of equipment
- Each approved application must yield > 20% productivity improvement

- Technology or process improvement projects
- Co-fund up to 70% of cost of technology or process improvement
- Each application must yield > 20% productivity improvement

Higher capital investments
Enhanced funding support for game-changing technologies

Examples of projects supported by PIP during the 1st tranche

- **Extension of Crowne Plaza Changi Airport**
  First private sector development adopting PPVC

- **Executive Condominium at Canberra Drive**
  First large-scale residential adopting PPVC

To encourage voluntary adoption of game-changing technologies, PIP funding cap raised from $5mil to $10mil

Higher capital investments
Measures under 2nd Roadmap – Facilitate better integration of value chain

- Integrate value chain for greater productivity
- **Funding support for collaborative BIM**
- Encourage stakeholders to collaborate using common BIM model
- Support stakeholders in adopting a Virtual Design and Construction (VDC) approach

% of Applicants in each BIM Funding Scheme

- Firm-Based 80%
- Collaboration 20%

Lack of BIM collaboration
Moving beyond BIM: Virtual Design and Construction

Past

2D design & hardcopy
2D CAD drawings

Present

3D BIM
Firm-level BIM
Collaborative BIM

Future

4D & 5D BIM
Collaborative Virtual Design & Construction

Better Integration of Value Chain
Summary of Measures

**2nd CPCF Tranche Funding**

- HIGHER QUALITY WORKFORCE
  - Workforce Training and Upgrading (WTU)
  - Scholarships & Sponsorships

- HIGHER CAPITAL INVESTMENT
  - Productivity Innovation Projects (PIP)
  - Mechanisation Credit (MechC)

- BETTER INTEGRATION OF VALUE CHAIN
  - BIM Fund (Collaboration & VDC)

---

**Other Measures**

- Build Up R1 Workers
- Individual Productivity Roadmaps for Government Agencies
- Collaborative BIM requirement for public sector projects
- Adjust Levy Rates
- Tendering Advantage in Public Sector Contracts
- GLS/iGLS Productivity Requirements
Price Quality Method (PQMV2)
To provide a more structured framework for non-price criteria to be assessed alongside with price. PQM translates the qualitative attributes into quantitative scores which, when combined with price score will enable the most suitable contractor that provides the best offer to be selected for award.
PQM framework

PQM framework applies to all public sector construction tenders under the BCA construction workhead (CW01 and CW02) with an Estimated Procurement Value (EPV) of $3 million and above.
Price Quality Method (PQMv2)

- Give tendering advantage to productive builders in public sector projects.
- Further raised productivity weightage
- With effect from 01 Jan 2016
Weightings for PQM

Design-bid-build project

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>70%</td>
</tr>
<tr>
<td>Productivity</td>
<td>10%</td>
</tr>
<tr>
<td>Quality</td>
<td>20%</td>
</tr>
</tbody>
</table>

100%
## Weightings for PQM

### Design and build project

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>(50%, 60% or 70%)</td>
</tr>
<tr>
<td>Productivity</td>
<td>(10%)</td>
</tr>
<tr>
<td>Quality</td>
<td>(20%, 30% or 40%)</td>
</tr>
</tbody>
</table>
Total PQM Score = Price Score + Productivity Score + Quality Score

Tenderer with the highest combined PQM score will be awarded the contract
Tenderer with the highest total raw quality points will be given maximum quality score.

\[
\text{Quality score (Q-score)} = \frac{\text{Tenderer’s total Quality Points}}{\text{Highest total Quality Points}} \times \text{Quality Weightage}
\]

Attributes under the Quality component include:
1. Relevant Track Record
2. Performance in past or ongoing projects
3. Project proposal and technical resources
4. Safety performance (mandatory attributes with at least 15% of the total quality points)
## Price Quality Method (PQMc2)

### Quality Score Computation (example)

The Quality score (Q-score) can be calculated using the following formula:

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

<table>
<thead>
<tr>
<th>Quality</th>
<th>( Q_{\text{raw}} ) (upon 100)</th>
<th>Tenderer A</th>
<th>Tenderer B</th>
<th>Tenderer C</th>
<th>Tenderer D</th>
<th>Tenderer E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>( Q_{\text{score}} ) (20pts)</td>
<td>17.86</td>
<td>20</td>
<td>-</td>
<td>13.78</td>
<td>17.79</td>
</tr>
</tbody>
</table>

**PQM configuration:**

\[ 70:10:20 \]

**Minimum Total Quality Points:**

55 points

*Tenderer C did not meet minimum total quality score; it will not be evaluated further.*
Productivity Score Computation

Productivity Component

- Price: 100%
- Productivity (10%)
- Quality

Constructability Score Index
CS Index (8%)

Technology Adoption (Construction) Index
TA(C) Index (1%)

Workforce Development (Construction) Index
WD(C) Index (1%)

BCA updates these 3 indices quarterly
Productivity Score Computation

**Constructability Score**
CS Index (8%)

**Technology Adoption**
TA(C) Index (1%)

**Workforce Development**
WD(C) Index (1%)

Productivity score (PD score) =

Scores from [CS Index + TA(C) Index + WD(C) Index]
<table>
<thead>
<tr>
<th>Productivity</th>
<th>Score for CS Index</th>
<th></th>
<th>Score for TA(C) Index</th>
<th></th>
<th>Score for WD(C) Index</th>
<th></th>
<th>PD-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenderer A</td>
<td>(8pts)</td>
<td>8</td>
<td></td>
<td>7.51</td>
<td></td>
<td>-</td>
<td>7.28</td>
</tr>
<tr>
<td>Tenderer B</td>
<td>(1pts)</td>
<td>0</td>
<td></td>
<td>1</td>
<td></td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Tenderer C</td>
<td>(1pts)</td>
<td>0</td>
<td></td>
<td>1</td>
<td></td>
<td>-</td>
<td>0.71</td>
</tr>
<tr>
<td>Tenderer D</td>
<td>(10pts)</td>
<td>8</td>
<td></td>
<td>9.51</td>
<td></td>
<td>-</td>
<td>7.99</td>
</tr>
<tr>
<td>Tenderer E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.77</td>
</tr>
</tbody>
</table>

** Tenderer E has no CS Index. Its score for CS Index is computed from the average of Tenderer A, B and D.
Price Score Computation

The lowest tender price will be given the maximum price score.

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

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

<table>
<thead>
<tr>
<th>Tenderer</th>
<th>Tender Sum (M$)</th>
<th>P-score (70pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12.5</td>
<td>67.2</td>
</tr>
<tr>
<td>B</td>
<td>13</td>
<td>64.62</td>
</tr>
<tr>
<td>C</td>
<td>11.7</td>
<td>-</td>
</tr>
<tr>
<td>D</td>
<td>12</td>
<td>70</td>
</tr>
<tr>
<td>E</td>
<td>13.5</td>
<td>62.22</td>
</tr>
</tbody>
</table>
**Case Example**

**PQM configuration**: 70:10:20

**Minimum Total Quality Score**: 55 points

- Tenderer E with no CS Index
- Tenderer A with no TA(C) and WD(C) – awarded zero for both attributes
- Tenderer D with no TA(C) – awarded zero for TA(C) Index attributes

<table>
<thead>
<tr>
<th>Quality</th>
<th>Tenderer A</th>
<th>Tenderer B</th>
<th>Tenderer C</th>
<th>Tenderer D</th>
<th>Tenderer E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qraw (upon 100)</td>
<td>84.1</td>
<td>94.2</td>
<td>48.8*</td>
<td>64.9</td>
<td>83.8</td>
</tr>
<tr>
<td>Q-score (20pts)</td>
<td>17.86</td>
<td>20.00</td>
<td>-</td>
<td>13.78</td>
<td>17.79</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Productivity</th>
<th>Score for CS Index (8pts)</th>
<th>8.00</th>
<th>7.51</th>
<th>-</th>
<th>7.28</th>
<th>7.59**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score for TA(C) Index (1pts)</td>
<td>0</td>
<td>1.00</td>
<td>-</td>
<td>0</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>Score for WD(C) Index (1pts)</td>
<td>0</td>
<td>1.00</td>
<td>-</td>
<td>0.71</td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td>PD-score (10pts)</td>
<td>8.00</td>
<td>9.51</td>
<td>-</td>
<td>7.99</td>
<td>8.77</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Price</th>
<th>Tender Sum (M$)</th>
<th>12.5</th>
<th>13.0</th>
<th>11.7***</th>
<th>12.0</th>
<th>13.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-score (70pts)</td>
<td>67.2</td>
<td>64.62</td>
<td>-</td>
<td>70.00</td>
<td>62.22</td>
<td></td>
</tr>
</tbody>
</table>

**Total PQM score (Q-score + PD-score + P-score)**

<table>
<thead>
<tr>
<th>Tenderer A</th>
<th>Tenderer B</th>
<th>Tenderer C</th>
<th>Tenderer D</th>
<th>Tenderer E</th>
</tr>
</thead>
<tbody>
<tr>
<td>93.06</td>
<td>94.13</td>
<td>-</td>
<td>91.77</td>
<td>88.78</td>
</tr>
</tbody>
</table>

**Overall position**

<table>
<thead>
<tr>
<th>Tenderer A</th>
<th>Tenderer B</th>
<th>Tenderer C</th>
<th>Tenderer D</th>
<th>Tenderer E</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

* Did not meet minimum total quality points; tender will not be evaluated further.
** Average of all scores (for CS Index) is awarded to Tenderer E, which had no CS Index.
*** The $11.7m bid has been disqualified, the next lowest bid will be considered as the lowest bid.
Price Quality Method (PQMv2)

Constructability Score (CS) Index, Technology Adoption (TA) Index & Incentive Schemes for Technology Adoption
Price Quality Method (PQMv2)

Weightings for PQM.
- Price: 50% – 70%
- Productivity: 10%
- Quality: 40% – 20%, correspondingly
1. Constructability Score

### Constructability Appraisal System

<table>
<thead>
<tr>
<th>Main Components</th>
<th>Max Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Structural System</td>
<td>Max 60</td>
</tr>
<tr>
<td>2 Architectural, Mechanical, Electrical &amp; Plumbing System</td>
<td>Max 50</td>
</tr>
<tr>
<td>3 Good Industry Practices</td>
<td>Max 10</td>
</tr>
</tbody>
</table>

Constructability Score
1. Constructability Score

- Constructability Score (C-Score) in PQM framework is not new

- It was one of the Quality attributes in tender evaluation since 15 Jul 2013
1. Constructability Score

Scoring is based on:

• Constructability Score Index (CS Index)

• latest completed projects (up to 5) during the last 3 years
Constructability Score Index (CS Index)

\[
CS\ Index = \frac{I_1 + I_2 + \cdots + I_N}{N} \times 100
\]

Where

\[
I_X = \left( \frac{\text{Contractor's Constructability Score achieved in Project } X}{\text{Legislated Minimum CS Score in Project } X} \right)
\]

\(N = \text{number of projects completed in the last 3 years (capped at 5 latest)}\)
1. Constructability Score

Illustration on Computation of CS Index

1. Assume that the C-Scores of the latest 5 projects completed by a contractor are as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Contractor’s C-Score achieved</th>
<th>Legislated Minimum C-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1</td>
<td>43</td>
<td>40</td>
</tr>
<tr>
<td>Project 2</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>Project 3</td>
<td>53</td>
<td>50</td>
</tr>
<tr>
<td>Project 4</td>
<td>55</td>
<td>50</td>
</tr>
<tr>
<td>Project 5</td>
<td>58</td>
<td>50</td>
</tr>
</tbody>
</table>

\[
CS\ Index = \frac{\frac{43}{40} + \frac{45}{40} + \frac{53}{50} + \frac{55}{50} + \frac{58}{50}}{5} \times 100
\]

\[
CS\ Index = 110.4
\]
1. Constructability Score

Illustration on Computation of CS Index

2. Assume that the contractor has only 3 projects with C-Scores as follows:

<table>
<thead>
<tr>
<th></th>
<th>Contractor’s C-Score Achieved</th>
<th>Legislated Minimum C-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1</td>
<td>43</td>
<td>40</td>
</tr>
<tr>
<td>Project 2</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>Project 3</td>
<td>53</td>
<td>50</td>
</tr>
</tbody>
</table>

\[
CS\ Index = \frac{\frac{43}{40} + \frac{45}{40} + \frac{53}{50}}{3} \times 100
\]

\[
CS\ Index = 108.7
\]
1. Constructability Score

How is CS Index of Contractor firm being evaluated in Tender?

CS Index Score = Tenderer’s CS Index*  
----------------------------------- X Weightage (8%)  
Highest Tenderer’s CS Index

*CS Index can be obtained via BCA website and updated on a quarterly basis
1. Constructability Score

How is CS Index of Contractor firm being evaluated in Tender?

- Tenderers with no CS Index will be given average points across all tenderers

<table>
<thead>
<tr>
<th>Contractor</th>
<th>CS Index</th>
<th>CS Index Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor A</td>
<td>120.2</td>
<td>7.36</td>
</tr>
<tr>
<td>Contractor B</td>
<td>130.6</td>
<td>8</td>
</tr>
<tr>
<td>Contractor C</td>
<td>125.6</td>
<td>7.69</td>
</tr>
<tr>
<td>Contractor D</td>
<td>100.7</td>
<td>6.17</td>
</tr>
<tr>
<td>Contractor E</td>
<td>-</td>
<td>7.31</td>
</tr>
</tbody>
</table>

- For cases where only one or none of the tenderers has CS Index, the CS Index attribute will be discarded
2. Investment in Technology Adoption

Productivity component

1. Constructability Scores
   CS Index (8%)

2. Investment in Technology Adoption
   TA(C) Index (1%)

Investment in Workforce Development
   WD(C) Index (1%)

2 (a) MechC -- 30%
2 (b) PIP -- 30%
2 (c) BIM -- 40%
2 (a) Investment in Technology Adoption – Mechanisation Credit (MechC)

- Co-fund site mechanisation through **purchase & lease of equipment**
- **Funding cap of $250,000 per firm**
- **Co-fund up to 70% of cost of equipment**
- Each approved application **must yield > 20% productivity improvement**
**2 (a) Investment in Technology Adoption – Mechanisation Credit (MechC)**

**MechC Scheme** *(for purchase)*

<table>
<thead>
<tr>
<th>Standard MechC scheme (to meet 20% productivity improvement)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment cost ≤ $100,000</td>
<td>50% capped at $20,000</td>
</tr>
<tr>
<td>Equipment cost &gt; $100,000</td>
<td>20% capped at $100,000</td>
</tr>
</tbody>
</table>

| Enhanced MechC scheme (to meet 30% productivity improvement) |
|---|---|
| Equipment cost ≤ $125,000 | 70% capped at $25,000 |
| Equipment cost > $125,000 | 20% capped at $100,000 |
**MechC Scheme (for leasing)**

### Standard MechC scheme (to meet 20% productivity improvement)

<table>
<thead>
<tr>
<th>Leasing cost</th>
<th>Capped Percentage</th>
<th>Maximum Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leasing cost ≤ $30,000</td>
<td>50%</td>
<td>$6,000</td>
</tr>
<tr>
<td>Leasing cost &gt; $30,000</td>
<td>20%</td>
<td>$30,000</td>
</tr>
</tbody>
</table>

### Enhanced MechC scheme (to meet 30% productivity improvement)

<table>
<thead>
<tr>
<th>Leasing cost</th>
<th>Capped Percentage</th>
<th>Maximum Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leasing cost ≤ $30,000</td>
<td>70%</td>
<td>$6,000</td>
</tr>
<tr>
<td>Leasing cost &gt; $30,000</td>
<td>20%</td>
<td>$30,000</td>
</tr>
</tbody>
</table>
**Examples of calculating MechC score**

<table>
<thead>
<tr>
<th>UEN</th>
<th>Company Name</th>
<th>Total Funding Disbursed</th>
<th>MechC Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>198012345W</td>
<td>ABC PTE LTD</td>
<td>$138,600</td>
<td>16.63</td>
</tr>
</tbody>
</table>

* MechC Score is calculated as:

\[
\frac{138,600}{250,000} \times 30 = 16.63
\]
2 (a) Investment in Technology Adoption – Mechanisation Credit (MechC)

Examples of supportable equipment:

- Demolition Machine (Remote Controlled)
- Crawler Crane
- Telescopic Clamshell
- Site Dumper
- Concrete Pump
- Magic Arm
- Boom Lift
- Mobile Concrete Crusher
2 (a) Investment in Technology Adoption – Mechanisation Credit (MechC)

Examples of supportable equipment

- Screed Leveller
- Cordless Drill w/ Dust Removal System
- Long Reach Sander
- Fastening Tool (Gas-Actuated)
- Power Trowel (Walk-Behind)
- Mini Scissor Lift
- Spray Paint Machine
- Total Station (Refractorless)
- Laser Leveller (Rotating)
- Plasma Cutting Machine
2 (b) Investment in Technology Adoption – Productivity Innovation Projects (PIP)

• Encourage industry stakeholders to embark on development projects that **improve productivity** through **technology adoption** and **process re-engineering** to achieve higher site productivity.

• Co-fund the adoption of technologies which supports the concept of **Design for Manufacturing and Assembly (DfMA)**.

• Achieve at least 20% productivity improvement.
### 2 (b) Investment in Technology Adoption – Productivity Innovation Projects (PIP)

<table>
<thead>
<tr>
<th>Category</th>
<th>Standard PIP</th>
<th>Enhanced PIP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firm</strong></td>
<td>- Co-funded up to 50%</td>
<td>- Co-funded up to 70%*</td>
</tr>
<tr>
<td></td>
<td>- Capped at $100,000 per application.</td>
<td>- Capped up to $300,000 per application (for selected technologies)</td>
</tr>
<tr>
<td><strong>Prefabricator</strong></td>
<td>- Co-funded up to 50%</td>
<td>- Co-funded up to 70%*</td>
</tr>
<tr>
<td></td>
<td>- Capped at $500,000 per application.</td>
<td>- Capped up to $500,000 per application</td>
</tr>
<tr>
<td></td>
<td>- Capped up to $1,000,000 per application for highly automated technology</td>
<td>- Capped up to $1,000,000 per application for highly automated technology</td>
</tr>
<tr>
<td><strong>Group</strong> (At least two unrelated companies)</td>
<td>- Co-funded up to 50%</td>
<td>- Co-funded up to 70%*</td>
</tr>
<tr>
<td></td>
<td>- Capped at $500,000 per application.</td>
<td>- Capped up to $500,000 per application</td>
</tr>
<tr>
<td><strong>Industry</strong> (To be actively led by a public agency with at least two unrelated companies)</td>
<td>- Co-funded up to 70%</td>
<td>- Co-funded up to 70%**</td>
</tr>
<tr>
<td></td>
<td>- Capped at $1,000,000 per application.</td>
<td>- Capped up to $10,000,000 per application</td>
</tr>
</tbody>
</table>

* Firms have to meet at least 30% in productivity improvement and demonstrate capability development in the areas of **financial standing, human resource development and certifications or awards**.

** Firms have to meet at least 40% in productivity improvement, and adopt impactful technology which demonstrate the potential to greatly transform the industry’s current state.
### 2 (b) Investment in Technology Adoption – Productivity Innovation Projects (PIP)

**Examples of calculating PIP score**

<table>
<thead>
<tr>
<th>UEN</th>
<th>Company Name</th>
<th>Total Funding Disbursed</th>
<th>PIP Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>198012345W</td>
<td>XYZ PTE LTD</td>
<td>$180,000</td>
<td>24</td>
</tr>
</tbody>
</table>

*PIP Score is calculated as:

Assume that Company XYZ of $180,000 is in the range of 80% percentile, this TA(C)PIP shall equal to $0.8 \times 30 = 24$.

80% percentile \times 30 = 24

---

**Note:**

**Step 1:** Determine the percentile of the fund disbursed to the firm relative to the industry (eg. 20%, 40%, 60%, 80% & 100%).

**Step 2:** Company XYZ’s TAC PIP value equals to the percentile \times 30 points.
2 (b) Investment in Technology Adoption – Productivity Innovation Projects (PIP)

Examples of Productive Technologies

- Climbing Scaffold
- Prefabricated Bathroom Unit
- Self Compacting Concrete
- Hybrid Precast & Steel Construction
- Prefabricated Air - con Ducts
- Flexible Sprinkler Droppers

Price Quality Method (PQMv2)
Examples of Productive Technologies

- Innovative Precast System
- Prefabricated Prefinished Volumetric Construction (PPVC)
- Cross Laminated Timber (CLT)
- Rockwool Blanket Fire Protection
- Mechanical Coupling
- Flexible Pipe
2 (c) Investment in Technology Adoption – Building Information Model (BIM) Fund

- Maximum of 3 applications per firm
- Co-fund up to 70% of cost for training, consultancy service, software & hardware
- Each approved application must yield > 20% or > 30% efficiency improvement
### BIM Fund V2

<table>
<thead>
<tr>
<th>BIM Fund V2</th>
<th>% support on supportable costs</th>
<th>Funding cap per application</th>
</tr>
</thead>
</table>
| • Min 2 firms  
• Min 20% efficiency improvement | Up to 50% | $ 30,000  
(Amount spend $60K) |
| • Min 3 firms  
(at least 1 consultant and 1 main-con)  
• Min 30% efficiency improvement | Up to 70% | $ 30,000  
(Amount spend $42K) |
## 2 (c) Investment in Technology Adoption – Building Information Model (BIM) Fund

### Examples of calculating BIM score

<table>
<thead>
<tr>
<th>UEN</th>
<th>Company Name</th>
<th>Total Funding Disbursed</th>
<th>BIM TA Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>198012345W</td>
<td>ABC PTE LTD</td>
<td>$51,420</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount Range</th>
<th>$1 - $39,000</th>
<th>$39,001 - $78,000</th>
<th>$78,001 - $117,000</th>
<th>$117,001 - $156,000</th>
<th>$156,001 - $F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentile</td>
<td>0.2</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td>1.0</td>
</tr>
</tbody>
</table>

$F=\text{Max amount disbursed}$

* BIM Score is calculated as:

Assume that Company ABC of $51,420 is in the range of 0.4 percentile, this TA(C)BIM shall equal to $0.4 \times 40 = 16$. 

---

2 (a) MechC -- 30%
2 (b) PIP -- 30%
2 (c) BIM -- 40%

---

Price Quality Method (PQMv2)
Computation of Workforce Development (Construction) Index
Investment in Workforce Development – WD(C) Index

PRICE-QUALITY METHOD (PQM) Framework

- Price
- Productivity (10%)
- Quality

Constructability cores
CS Index (8%)

Investment in Technology Adoption
TA(C) Index (1%)

Investment in Workforce Development
WD(C) Index (1%)

WD(C) Index - 1%
- WTU – 0.5%
- Scholarship/ Sponsorship – 0.5%

Weightings for PQM.
- Price: 50% – 70%
- Productivity: 10%
- Quality: 40% – 20%, correspondingly
WD(C) Index =

Percentile Score of **WTU Funding Disbursed**\(^*\) \times 50

+ 

Percentile Score of **Scholarships/Sponsorships Funding Committed**\(^*\) \times 50

WD(C) Index is updated & published in BCA Website on a quarterly basis

\(^*\) Based on total funding disbursed/committed over the last 36 months
## Types of Supportable Courses

<table>
<thead>
<tr>
<th>Types of Supportable Courses</th>
<th>WTU funding support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiarisation course and skills assessment for CoreTrade registration</td>
<td></td>
</tr>
<tr>
<td>Training and certification in selected higher value-adding qualifications at supervisory level that are approved by BCA</td>
<td>Locals – Up to 90%</td>
</tr>
<tr>
<td>Foreigners – Up to 80%</td>
<td></td>
</tr>
<tr>
<td>Training and skills evaluation for the second SEC(K) certification leading to qualification of Multi-Skilling</td>
<td></td>
</tr>
<tr>
<td>Selected Professional Managerial Executive and Technical personnel (PMETs) courses that are directly related to productivity</td>
<td>Locals – Up to 90%</td>
</tr>
<tr>
<td>Foreigners – Up to 40%</td>
<td></td>
</tr>
</tbody>
</table>

# Example of courses supported under WTU

<table>
<thead>
<tr>
<th>Trades under CoreTrade/Multi-Skilling</th>
<th>PMET Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cladding Installation</td>
<td>1-Day Workshop on Prefabricating Our Future – Prefabricated Bathroom Units (PBU)</td>
</tr>
<tr>
<td>Interior Drywall Installation</td>
<td>2-Day Course on BIM Planning</td>
</tr>
<tr>
<td>Precast Concrete Component Erection</td>
<td>Certificate Course in BIM Management</td>
</tr>
<tr>
<td>Precast Kerb and Drain Laying</td>
<td>Stanford CIFE-BCA Advanced Management Program on Virtual Design and Construction</td>
</tr>
<tr>
<td>System Formwork</td>
<td></td>
</tr>
</tbody>
</table>

Please refer to the following links for the list of courses supported under WTU:
- CoreTrade Scheme - [https://www.bca.gov.sg/CoreTrade/](https://www.bca.gov.sg/CoreTrade/)
- Multi-Skilling Scheme - [http://www.bca.gov.sg/MultiSkilling/MultiSkill_Main.html](http://www.bca.gov.sg/MultiSkilling/MultiSkill_Main.html)
### Example of calculating WTU Score

**ABC Pte Ltd**

<table>
<thead>
<tr>
<th>Employees in courses supported under WTU</th>
<th>Amount disbursed to firm over the last 36 months</th>
<th>Indicative Range of Disbursed Amount</th>
<th>Percentile</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x workers attended Electrical Wiring Installation for Tradesmen</td>
<td>2 x $900 = $1,800</td>
<td>&gt;$A</td>
<td>&gt;80th Percentile</td>
<td>100%</td>
</tr>
<tr>
<td>3 x workers attended Hydraulic Excavator Operation for Tradesmen</td>
<td>3 x $800 = $2,400</td>
<td>$B &lt; $4,200 ≤ $A</td>
<td>61st – 80th Percentile</td>
<td>80%</td>
</tr>
<tr>
<td>Total</td>
<td>$4,200</td>
<td>$C &lt; x ≤ $B</td>
<td>41st – 60th Percentile</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$D &lt; x ≤ $C</td>
<td>21st – 40th Percentile</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ $D</td>
<td>1st – 20th Percentile</td>
<td>20%</td>
</tr>
</tbody>
</table>

*WTU Score is calculated as:*

\[
0.8 \times 50 = 40
\]

---

**Investment in Workforce Development**

WD(C) Index (1%)

- WTU – 0.5%
- Scholarship/Sponsorship – 0.5%
| PME | • Undergraduate Scholarship/Sponsorship (full-time)  
|     | • Undergraduate Sponsorship (part-time)  
|     | • Postgrad Sponsorship (part-time)  

| TAP supervisory | • Diploma Scholarship/Sponsorship (full-time)  
|                 | • Diploma Sponsorship (part-time)  

| Junior Supervisory & Foreman | • ITE Scholarship (full-time)  
|                              | • Building Specialist Sponsorship (Foreman/Supervisor)  

Enhanced  
New
### Example of calculating Scholarship/Sponsorship Score

**ABC Pte Ltd**

<table>
<thead>
<tr>
<th>Scholarship/Sponsorship Award</th>
<th>Amount committed to firm over the last 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Undergraduate Scholarship</td>
<td>$24,000</td>
</tr>
<tr>
<td>1 Undergraduate Sponsorship</td>
<td>$7,000</td>
</tr>
<tr>
<td>1 Diploma Scholarship</td>
<td>$11,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$42,000</strong></td>
</tr>
</tbody>
</table>

**Indicative Range of Committed Amount**

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;$A</td>
<td>100%</td>
</tr>
<tr>
<td>$B&lt; x ≤$A</td>
<td>80%</td>
</tr>
<tr>
<td>$C&lt; $42,000 ≤$B</td>
<td>60%</td>
</tr>
<tr>
<td>$D&lt; x≤$C</td>
<td>40%</td>
</tr>
<tr>
<td>≤ $D</td>
<td>20%</td>
</tr>
</tbody>
</table>

*Scholarship/Sponsorship Score is calculated as: 0.6 x 50 = 30*
WD(C) Index

Computation of WD(C) Index for ABC Pte Ltd

ABC Pte Ltd’s WD(C) Index

= WTU Score + Scholarship/Sponsorship Score

= 40 + 30

= 70