



Development Bureau

Buildability Evaluation System for Public Engineering Works Projects – BES(E)

USER MANUAL OF BES(E) ASSESSMENT TOOL

(Revision 2)
December 2022

CONTENTS

1 INTRODUCTION	2
2 OBJECTIVES	2
3 APPLICATIONS AND LIMITATIONS	2
3.1 Recommended Operating System Requirements	2
3.2 Applications of BES(E) Tool	2
4 COVERAGE AND FUNCTIONALITY	3
5 CHARACTERISTICS OF THE TOOL	3
5.1 User-friendliness with Seamless Experience.....	3
5.2 Clean and Clear User Interface.....	3
5.3 Intuitive Workflow Navigation.....	3
5.4 Flexibility and Integrity of User Input.....	4
5.5 Consistently Accurate Calculation with Reliable Results.....	4
5.6 Reduced Administrative Burden and Data Input	4
5.7 Ability to Collect Data for Future Analytics.....	4
5.8 Futureproofing and Expandability	4
6 USER INTERFACE	5
6.1 Area A – Workflow Control	5
6.2 Area B – Menu Button	6
6.3 Area C – Dashboard.....	6
6.4 Area D – Input Form.....	7
7 WORKFLOW IN BES(E) TOOL	8
7.1 Before You Start.....	8
7.2 Input Project Information	8
7.3 Input for Module 1 to Module 4.....	10
7.3.1 Yes/No Input	10
7.3.2 Numerical Input.....	11
7.4 Input for Module 5 - Innovation and Creativity.....	11
8 FUTURE REFINEMENT	13

APPENDICES

APPENDIX A

Design and Scoring Guidelines for Using the BES(E) Tool

APPENDIX B

Terms and Definitions

APPENDIX C

Example Assessment on projects with multi-zoning works

APPENDIX D

Key Considerations on qualitative assessment items

APPENDIX E

Example Assessment on projects with multi-disciplinary works

APPENDIX F

Example Assessment on projects with imposed conditions

APPENDIX G

Innovative Items

1 INTRODUCTION

In 2018 the Development Bureau (“DEVB”) of the Government of the HKSAR conducted a research study for developing a Buildability Evaluation system for engineering works projects (“BES(E)”) based on the 3S+ principle (namely “Standardisation”, “Simplification” and “Single Integrated Elements” and project life cycle management). The study aims at adopting a similar approach in setting up an evaluation system for Public Engineering Works Projects, namely, Buildability Evaluation System for Engineering projects.

The objective of this BES(E) Study is to encourage good design practices and construction methodologies in engineering works projects, identify opportunities for further improvement for the constructability of the projects and develop a functional BES(E) to evaluate the buildability performance of designs elements for Public Engineering Works Projects.

At the end of this research study, the BES(E) Scoring System, together with BES(E) Tool (Version 1.0) has been developed and promulgated in April 2020 under DEVB Technical Circular (Works) No. 6/2020. Version 2.0 update was released in October 2021 for use during the Stage 2 Implementation.

Based on the further research study conducted, for Stage 3 Implementation, a further enhanced BES(E) Tool (Version 3.0) has been launched. This manual is based on BES(E) Tool (Version 3.0) as the guidelines when conducting the assessment.

2 OBJECTIVES

The BES(E) Tool aims at consolidating the findings and recommendations in the research studies and providing an intuitive application, with proper graphic user interfaces, for the users to evaluate the buildability of their projects effectively. It shall be noted that the evaluation is not a pure quantitative exercise and engineering judgement shall be exercised to arrive at a reasonable BES(E) Score.

For further details on the design & scoring guidelines please refer to **Appendix A**.

3 APPLICATIONS AND LIMITATIONS

3.1 Recommended Operating System Requirements

The BES(E) Tool is developed in the Microsoft Access 2016 environment. To ensure best user experience, the following operating system requirements are recommended: -

1. Operate in Microsoft Access 2016;
2. Install with fonts that support the language “English”;
3. Display in monitor with resolution of “1920x1080”;
4. Support Portable Document Format (PDF) printing;

3.2 Applications of BES(E) Tool

BES(E) Tool is designed to enable users to evaluate a multi-disciplinary large-scale civil engineering project. Except those projects stated in the BES(E) Guidelines promulgated by under DEVB TC(W) No. 6/2020, all relevant civil engineering projects shall be evaluated using the BES(E) Tool to enhance the project buildability. In order to better allocate the effort

of the assessment teams including project team and consultants) (“Users”), who will be using the BES(E) Tool, items in the BES(E) Tool are shortlisted based primarily on the relevance to buildability. Users will be required to go through the BES(E) Tool section by section and provide their input to the BES(E) Tool according to the guidelines given in the BES(E) Tool to assess the BES(E) Score for the project. It should be noted that the BES(E) Tool is best applied in a contract-based manner.

4 COVERAGE AND FUNCTIONALITY

As mentioned, BES(E) Tool is designed to enable Users to evaluate the multi-disciplinary large-scale civil engineering projects. Due consideration has been given to a shortlisting process of key items to avoid an extensively long lists of works items to be evaluated. In this connection, coverage of the BES(E) Tool is limited only to those works items that have a significant bearing on buildability. Works items that are of low significance will not be included in the BES(E) Tool.

For works items that are not available in a Works Category in the BES(E) Tool, Users are recommended to read through the user manual embedded in the BES(E) Tool for more details.

5 CHARACTERISTICS OF THE TOOL

Microsoft Access is used as the software platform for the BES(E) tool mainly because of its user-friendly interface and ease of retrieval of data for future analysis. The tool has the following characteristics.

5.1 User-friendliness with Seamless Experience

While the evaluation of buildability for a civil project involves numerous choices including design options, construction methods, choices of materials, etc., the BES(E) Tool is devised to include a weighting mechanism such that Users would not be required to cross reference with other documents and/or calculations in other platforms.

5.2 Clean and Clear User Interface

The user interface is clearly defined into four (4) screen areas for input. Users can follow the guidelines in the user interface for input and would not be required to cross-reference to other materials for proper input to the BES(E) Tool. Further details are given in **Section 6** below.

5.3 Intuitive Workflow Navigation

The Workflow in BES(E) Tool is designed to be completed in a section-by-section approach. Users will be required to press the “Next” button before they can access to the next section for input. By this, the BES(E) Tool will guide the Users to input all necessary data for the evaluation.

5.4 Flexibility and Integrity of User Input

Although the tool provides for flexibility for the Users to choose the appropriate works items in the BES(E) Tool, input from Users on these items is constrained to a pre-defined data format to avoid miscalculation. More details are given in **Section 7** below.

5.5 Consistently Accurate Calculation with Reliable Results

Whilst there are numerous combinations of works items, depending on the nature of the project, the BES(E) Tool gives a consistently accurate calculation based on user input. This enhances the reliability of the BES(E) Score obtained.

5.6 Reduced Administrative Burden and Data Input

The report layout has been designed and embedded in the BES(E) Tool for ease and consistency of submissions. No additional editing on the printing layout would be required.

5.7 Ability to Collect Data for Future Analytics

To facilitate continuous refinement / development of the BES(E) System, the BES(E) Tool allows the Development Bureau to collect project data for future analysis from time to time. Once sufficient data has been collected from projects teams, more features from BES(E) Scoring System will be established.

5.8 Futureproofing and Expandability

The BES(E) Tool is equipped with a degree of futureproofing. Upon review of the assessment items and scoring mechanism, authorised administrators can refine the items and scoring mechanism concerned to maintain the validity of the BES(E) Score obtained.

6 USER INTERFACE

The basic user interface is described in the following section.

The BES(E) Tool is mainly divided into four (4) screen areas as shown below: -

Development Bureau
DEVELOPMENT BUREAU

Buildability Evaluation System for Engineering Projects

Area A: Project Information

1. Management and Coordination
2. Site Planning and Usage
3. Details of Design
4. Maintenance Requirements
5. Innovation and Creativity

Area B: Navigation

- Home
- Print
- Help
- Setup
- Quit

Area C: Scoreboard

88	234
in Module 1	in Module 2
100	250
383	86
in Module 3	in Module 4
550	100
BONUS POINT IN MODULE 5	
0	200
791/1000	
Overall BES(E) Scores	

Area D: Project Details

PROJECT INFO

Contract No.

Contract Title

Project Stage

Commencement Date

Original Completion Date (3769 Days)

Substantial Completion Date (for Completed Contract Only) (3776 Days)

Total No. of EOT Granted/Agreed Extensions (for Completed Contract Only), please provide the summary of granted EOT/Agreed Extensions Days

Original Contract Sum HK\$ M

Final Contract Sum (for Completed Contract Only) HK\$ M

Amount of VVOs issued or accepted CEs (for Completed Contract Only), please provide the summary of VVO or accepted CE HK\$ M

Total Man-Day

Project Scope

	Estimated Cost	Weighting
G Geotechnical Works		
G.1 Slope Works	HK\$ <input type="text" value="1.00"/> M	10.0%
G.2 Site Formation/ Earthworks	HK\$ <input type="text" value="1.00"/> M	10.0%
G.3 Foundations Works	HK\$ <input type="text" value="1.00"/> M	10.0%
G.4 Ground Improvement Works	HK\$ <input type="text" value="1.00"/> M	10.0%
G.5 Tunnels, Caverns and Underground Space	HK\$ <input type="text" value="1.00"/> M	10.0%
R Roadworks		
R.1 Carriageway, Cycletrack and Footpath	HK\$ <input type="text" value="1.00"/> M	10.0%
R.2 Road Furnitures	HK\$ <input type="text" value="1.00"/> M	10.0%
R.3 Noise Barrier Form	HK\$ <input type="text" value="1.00"/> M	10.0%
Majority of works consists of: <input checked="" type="checkbox"/> Reinforced Concrete <input type="checkbox"/> Structural Steel		
D Drainage Works		
D.1 Pipelines	HK\$ <input type="text" value="1.00"/> M	10.0%
D.2 Manholes, Catchpits and Other Drainage Facilities	HK\$ <input type="text" value="1.00"/> M	10.0%

Version 4.0

Figure 1 Snapshot of BES(E) Tool – Project Info. Page

6.1 Area A – Workflow Control

Workflow Control Area contains 6 control buttons (Project Information button plus 5 Module buttons) to switch between the pages for the Project Information and the various modules. To ensure a smooth workflow while using the BES(E) Tool, the initial input will adopt a step-by-step approach such that Users will be required to input the necessary information into each relevant module (and sub-module) of the BES(E) Tool before they can move on to the next module.

Where Users wish to subsequently revise the project input, they can click on the control button to go back to the Project Information or a particular module for revision.

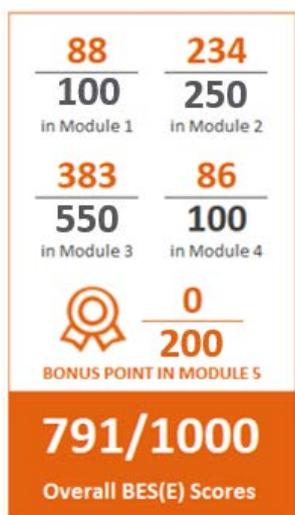
6.2 Area B – Menu Button

All functions in BES(E) Tool will be put in this area. Essential functions include: -

-  Home - go to the page for “Project Information”
-  Print - print the project in PDF file
-  Help - go to the User Manual
-  Set-up - to fine-tune the BES(E) Tool (for authorised administrators only)
-  Exit - quit the BES(E) Tool

6.3 Area C – Dashboard

Dashboard area is designed to display the overall BES(E) Score and how each module contributes to the overall BES(E) Score.

 <p>88 / 100 in Module 1</p> <p>234 / 250 in Module 2</p> <p>383 / 550 in Module 3</p> <p>86 / 100 in Module 4</p> <p>0 / 200 BONUS POINT IN MODULE 5</p> <p>791/1000 Overall BES(E) Scores</p>	<p>Module 1: Management and Coordination</p> <p>This module assesses the early stages of a project such as approvals and planning stages. It aims to encourage the use of methodologies in planning, management and coordination of a project as a means to enhance constructability and cost effectiveness.</p>
	<p>Module 2: Site Planning and Usage</p> <p>This module assesses the positioning of the site and use of the site in relation to constructability.</p>
	<p>Module 3: Details of Design</p> <p>This module assesses the design systems being proposed in a project including the use of construction technologies wherever applicable. This includes consideration for seven (7) major works categories including geotechnical works, roadworks, drainage and sewerage works, waterworks, marine works, elevated structure works and facility structure works.</p>
	<p>Module 4: Maintenance Requirements</p> <p>This module evaluates the degree of long-term maintenance and durability embodied in the design beyond the capital build.</p>
	<p>Module 5: Innovation and Creativity (Bonus Scores)</p> <p>This module gives allowance for Bonus Scores for other innovative systems and good practices being proposed.</p>
<p>The Overall BES(E) Score is the sum of scores from Module 1 to 5. It is obtained based on the degree of achievement of the design considerations provided within each Module. Once all modules are completed, the overall BES(E) Score will be automatically generated for review. No further actions will be required to generate the scoring system.</p>	

6.4 Area D – Input Form

This is the area where Users will be required to provide their inputs in (in pages of Project Information and Module 1 to 5) based on the design details from projects. Therefore, relevant design information such as drawings, specifications and other supporting materials should be ready for completing the assessment in the BES(E) Tool.

PROJECT
INFO

G Geotechnical Works			
G.1 Slope Works	HK\$	1.00	M 5.0%
G.2 Site Formation/ Earthworks	HK\$	1.00	M 5.0%
G.3 Foundations Works	HK\$	1.00	M 5.0%
G.4 Ground Improvement Works	HK\$	1.00	M 5.0%
G.5 Tunnels, Caverns and Underground Space	HK\$	1.00	M 5.0%
R Roadworks			
R.1 Carriageway, Cycletrack and Footpath	HK\$	1.00	M 5.0%
R.2 Road Furnitures	HK\$	1.00	M 5.0%
R.3 Noise Barrier Form	HK\$	1.00	M 5.0%
Majority of works consists of: <input checked="" type="checkbox"/> Reinforced Concrete <input type="checkbox"/> Structural Steel			
D Drainage Works			
D.1 Pipelines	HK\$	1.00	M 5.0%
D.2 Manholes, Catchpits and Other Drainage Facilities	HK\$	1.00	M 5.0%
D.3 Box Culverts	HK\$	1.00	M 5.0%
D.4 Nullahs, Engineered Channels, River Training Work	HK\$	1.00	M 5.0%
W Waterworks			
W.1 Pipelines	HK\$	1.00	M 5.0%
W.2 Service Reservoirs	HK\$	1.00	M 5.0%
M Marine Works			
M.1 Land Reclamation	HK\$	1.00	M 5.0%
M.2 Wave Protection	HK\$	1.00	M 5.0%
M.3 Pier/ Jetty Structures	HK\$	1.00	M 5.0%
E Elevated Structure Works			
E.1 Elevated Structure Works	HK\$	1.00	M 5.0%
Majority of works consists of: <input checked="" type="checkbox"/> Reinforced Concrete <input type="checkbox"/> Structural Steel			
E.2 Parapets and Barriers	HK\$	1.00	M 5.0%
E.3 External Finishes/Façade	HK\$	1.00	M 5.0%
F Facility Structures Works			
F.1 Facilities Structures Works	HK\$	1.00	M 0.0%

Figure 2 Area D – Input Form

7 WORKFLOW IN BES(E) TOOL

7.1 Before You Start

As the BES(E) Tool is built in Macro-enabled Microsoft Access, please click “Enable Content” / “啟用內容” to allow the Macro functions. After enabling Macro functions, please click “Start Using BES(E) Tool” to start your assessment exercise.



發展局
DEVELOPMENT BUREAU

Buildability Evaluation System for Engineering Projects

- Project Information
- 1. Management and Coordination
- 2. Site Planning and Usage
- 3. Details of Design
- 4. Maintenance Requirements
- 5. Innovation and Creativity

- Home
- Print
- Help
- Set-up
- Quit

88	234
100	250
in Module 1 in Module 2	
383	86
550	100
in Module 3 in Module 4	
	0
BONUS POINT IN MODULE 5	
200	
791/1000	
Overall BES(E) Scores	

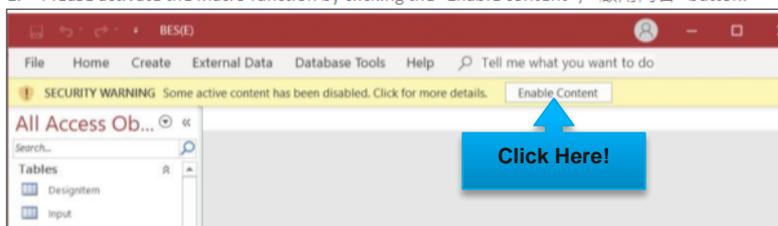
4.0
Version



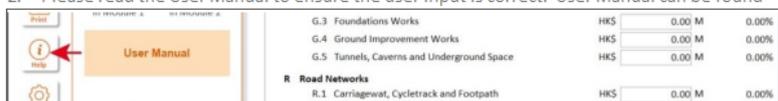
Welcome to BES(E) Tool!!

Please read the following notes before using the BES(E) Tool:-

1. Please activate the Macro function by clicking the "Enable content" / "啟用內容" button.



2. Please read the User Manual to ensure the user input is correct. User Manual can be found



Click Here! → **Start Using BES(E) Tool**

Figure 3 Before You Start for BES(E) Tool

7.2 Input Project Information

The Project Information page is the first page of the BES(E) Tool and consists of two tabs: “Project Scope” and “Project Zone”. This will be the starting point where Users will be required to enter the **Estimated Cost** in “Project Scope” tab for the main engineering components of the project. The BES(E) Tool will then automatically determine the relative weightings in Module 3 for these main engineering components based on the Estimated Costs and associated time factors which would govern the criticality of the works. For items of works that are not applicable to your project, please insert “0” in the Estimated Costs. Please note the values on preliminary items are required to be proportionally distributed to all concerned works categories.

Besides, the BES(E) Tool is aimed to assess the buildability of completed design. For those works requiring substantial contractor’s design input, such as E&M works, the estimated cost of such works shall be excluded from the Estimated Cost.

Users can then click on the “Next” button to move on to Module 1.

Project Information

1. Management and Coordination
2. Site Planning and Usage
3. Details of Design
4. Maintenance Requirements
5. Innovation and Creativity

Home
Print
Help
Set-up
Quit

4.0 Version

88 in Module 1 234 in Module 2

100 in Module 1 250 in Module 2

383 in Module 3 86 in Module 4

550 in Module 3 100 in Module 4

0 BONUS POINT IN MODULE 5

200

791/1000 Overall BES(E) Scores

PROJECT INFO

Contract No.

Contract Title

Project Stage

Commencement Date

Original Completion Date (3769 Days)

Substantial Completion Date (for Completed Contract Only) (3776 Days)

Total No. of EOT Granted/Agreed Extensions (for Completed Contract Only), please provide the summary of granted EOT/Agreed Extensions Days

Original Contract Sum HK\$ M

Final Contract Sum (for Completed Contract Only) HK\$ M

Amount of VVOs issued or accepted CEs (for Completed Contract Only), please provide the summary of VVO or accepted CE HK\$ M

Total Man-Day

Project Scope **Project Zone**

Click Here!

Project Zone	Estimated Cost	Weighting
G.1 Slope Works	HK\$ <input type="text" value="1.00"/> M	10.0%
G.2 Site Formation/ Earthworks	HK\$ <input type="text" value="1.00"/> M	10.0%
G.3 Foundations Works	HK\$ <input type="text" value="1.00"/> M	10.0%
G.4 Ground Improvement Works	HK\$ <input type="text" value="1.00"/> M	10.0%
G.5 Tunnels, Caverns and Underground Space	HK\$ <input type="text" value="1.00"/> M	10.0%
R Roadworks		
R.1 Carriageway, Cycletrack and Footpath	HK\$ <input type="text" value="1.00"/> M	10.0%
R.2 Road Furnitures	HK\$ <input type="text" value="1.00"/> M	10.0%
R.3 Noise Barrier Form	HK\$ <input type="text" value="1.00"/> M	10.0%
Majority of works consists of: <input checked="" type="checkbox"/> Reinforced Concrete <input type="checkbox"/> Structural Steel		
D Drainage Works		
D.1 Pipelines	HK\$ <input type="text" value="1.00"/> M	10.0%
D.2 Manholes, Catchpits and Other Drainage Facilities	HK\$ <input type="text" value="1.00"/> M	10.0%

Input Here!

Next

Figure 4 Project Information Input for BES(E) Tool

After finishing input under the Project Scope tab, please click “**Project Zone**” tab and input the **Estimated Cost** for each of the Project Zones defined by the Users. The BES(E) Tool allows for the Users to define up to five Project Zones with different site characteristics and constraints. Please input 0 for against the Project Zones not used. For the sake of data consistency, the total estimated cost in the “**Project Scope**” tab shall be equal to that in the “**Project Zone**” tab.

Appendix C of this manual shows a typical example on handling projects with multi-project zones.

Project Information

1. Management and Coordination
2. Site Planning and Usage
3. Details of Design
4. Maintenance Requirements
5. Innovation and Creativity

PROJECT INFO

Contract No.

Contract Title

Project Stage

Commencement Date

Original Completion Date (3769 Days)

Substantial Completion Date (for Completed Contract Only) (3776 Days)

Total No. of EOT/Granted/Agreed Extensions (for Completed Contract Only), please provide the summary of granted EOT/Agreed Extensions Days

Original Contract Sum HK\$ M

Final Contract Sum (for Completed Contract Only) HK\$ M

Amount of VVOs issued or accepted CEs (for Completed Contract Only), please provide the summary of VVO or accepted CE HK\$ M

Total Man-Day

Home
Print
Help
Set-up
Quit

88 **234**
100 **250**
in Module 1 in Module 2

383 **86**
550 **100**
in Module 3 in Module 4

0
200
BONUS POINT IN MODULE 5

791/1000
Overall BES(E) Scores

4.0
Version

PROJECT ZONE

Please input the estimated value of the five (5) most significant project zone of works.

Project Zone	Estimated Cost	Weighting	Remarks
Project Zone A	HK\$ <input type="text" value="1.00"/> M	20.0%	<input type="text"/>
Project Zone B	HK\$ <input type="text" value="1.00"/> M	20.0%	<input type="text"/>
Project Zone C	HK\$ <input type="text" value="1.00"/> M	20.0%	<input type="text"/>
Project Zone D	HK\$ <input type="text" value="1.00"/> M	20.0%	<input type="text"/>
Project Zone E	HK\$ <input type="text" value="1.00"/> M	20.0%	<input type="text"/>
Total Cost:	HK\$ <input type="text" value="\$5.00"/> M		

Figure 5 Project Zone Input

7.3 Input for Module 1 to Module 4

Users will be required to complete all **Modules 1 to 4** based on the considerations adopted in the development of the design of the project. Each design item will be assessed differently, therefore, please read the description carefully.

The descriptions are shown on the left column, while Users are required to provide input into the columns on the right. The input comes in two forms:

1. Yes/No Input
2. Numerical Input

7.3.1 Yes/No Input

Several questions require engineering judgement to justify whether the project can fulfil the specific criteria. Please check the checkbox where it is considered that the project can fulfil the criteria. Users are required to review if the design of the projects has gone through some key elements and/or considerations. Some of these are illustrated in **Appendix D** of this manual. An example of Yes/No or N/A Question is shown in Figure 6.

Description	Project Zone A	Project Zone B	Project Zone C	Project Zone D	Project Zone E	Remarks	% Gained
Option/preliminary study on site position and/or formation level is carried out to:-							
(1) facilitate construction access and logistics	Yes	No	No	Yes	N/A		14.7%
(2) minimise the generation of surplus excavated material	Yes	Yes	Yes	Yes	No		8.8%
(3) avoid major temporary traffic arrangement	No	Yes	N/A	No	Yes		0.0%
(4) avoid impact on main utilities and structures	Yes	N/A	Yes	No	No		8.8%
(5) facilitate easy access and delivery of sizeable construction plants to the site and within the site areas	N/A	No	N/A	Yes	Yes		0.0%
(6) avoid underground works at complex geology or using long piles	Yes	No	No	Yes	No		8.8%

Figure 6 Example of Yes/No or N/A Question Input

7.3.2 Numerical Input

For the questions requiring numerical input, values are to be entered in the first column after the Description column. The units for the values to be entered are shown in the adjacent column. Users are required to complete the numerical input for each assessment item based on the design information, such as the design drawings.

BES(E) Score will be updated automatically based on the value input. An example of Numerical Input is shown on Figure 7.

Description	Quantity	Unit	Remarks	% Gained
G1 - Slope Works	0			
1. Type of slope works	0			
No. of types of slope works involved	2	nr.		20.0%
2. Selection of slope works	0			
Total area of projected elevated of slopes / retaining structures	100	sq. m		
# Percentage of area on projected elevation – slopes only requiring surface protection	10	%		0.0%
# Percentage of area on projected elevation – soil cut slopes	10	%		22.8%
# Percentage of area on projected elevation – rock cut slopes	10	%		0.0%
# Percentage of area on projected elevation – slopes with soil nailing works	10	%		0.0%
# Percentage of area on projected elevation – fill slopes	10	%		12.0%
# Percentage of area on projected elevation – slopes with rock bolts / rock dowels	10	%		0.0%
# Percentage of area on projected elevation – slopes involving soil improvement works - bulk improvem	10	%		0.0%
# Percentage of area on projected elevation – slopes involving soil improvement works - improvement b	5	%		0.0%
# Percentage of area on projected elevation – retaining structures without piles	5	%		0.0%
# Percentage of area on projected elevation – retaining structures with piles	5	%		0.0%
# Percentage of area on projected elevation – reinforced earth wall	5	%		0.0%
# Percentage of area on projected elevation – flexible debris resisting barrier	5	%		0.0%
# Percentage of area on projected elevation – rigid barrier	5	%		0.0%
Any imposed condition? If yes, please input 1 in Quantity and provide justification in Remarks.	0			0.0%

Figure 7 Example of Numerical Input

7.4 Input for Module 5 - Innovation and Creativity

Module 5 takes a different approach in terms of assessing innovation and creativity. It encourages Users to identify possible innovative items for the project. Requirements on inputting potential innovative items are provided under the General Guideline Tab. Users should carefully consider the guidelines and provide a description of any innovative item identified for the project under each of Sub-Modules 5.1 to 5.4.

Project Information

1. Management and Coordination

2. Site Planning and Usage

3. Details of Design

4. Maintenance Requirements

5. Innovation and Creativity

MODULE
5

Innovation and Creativity

Proposed BES(E) Score for Module 5: 0/200

General Guideline Assessment of BES(E) Scores

The Government is committed to the promotion and adoption in capital works projects with a view to enhancing the design and construction and boosting up the buildability of the projects. In particular, there are five (5) specific considerations of concern to enhance the buildability of the projects and bonus BES(E) Points could be proposed for the Review Committee to review and accept.

The five (5) specific considerations of concern include:-

- (A) Reducing Life-cycle Cost
- (B) Reducing Construction Period
- (C) Reducing Labour Intensity
- (D) Reducing Reliance on Skilled Labour
- (E) Enhancing Construction Safety

Max. BES(E) Score of 40 is allowed for each consideration, subject to the endorsement by BES(E) Vetting Committee if otherwise. Please score in a 20 interval to reflect the degree of improvement in each aspect.

As examples, the following items could be considered in the planning and design of the projects to enhance buildability of the projects:-

1. Robotic/Autonomous Systems
2. Advanced Materials (e.g., low carbon footprint materials, self-healing materials, carbon capturing materials)
3. Predictive Analytics for Streamlining Construction & Maintenance Works
4. Internet of Things (IoT) Technologies

The examples above are only some suggestions and new ideas are always welcome!

88

100

in Module 1

234

250

in Module 2

383

550

in Module 3

86

100

in Module 4

0

200

BONUS POINT IN MODULE 5

791/1000

Overall BES(E) Scores

4.0
Version

Figure 8 Input for Module 5 – Innovation and Creativity

There are 5 attributes for assessing innovation and creativity for each innovative items and are listed as follows:

Attribute	Maximum Bonus Score	Score Interval
A. Reducing Life-cycle Cost.	40	Good Performance: 20 Excellent Performance: 40
B. Reducing construction period.	40	
C. Reducing Labour Intensity.	40	
D. Reducing Reliance on Skilled Labour.	40	
E. Enhancing Construction safety	40	

User shall input the score based on the attributes above for each innovation items. Detailed justifications, demonstrations and proofs on their innovative nature and their merits shall be provided for design review. For details, please refer to the instructions provided in **Appendix A** and **Appendix G** of the User Manual.

8 FUTURE REFINEMENT

Review of the validity and effectiveness of the BES(E) will be carried out from time to time by a dedicated team in DEVB. This user manual will then be updated accordingly with reference to the latest version of the BES(E) Tool.

APPENDIX A

Design and Scoring Guidelines for Using the BES(E) Tool

Module 1 – Management and Coordination

Item No.	Assessment Items / Aspects	Scoring Method	BES(E) Score Gain [Note 1]	Remarks						
1.1	Construction Period (Max. 35 BES(E) Score)									
	Allow adequate construction period for the works contract – 5 aspects: -									
	(1) Achievable scope and contract period in accordance with ETWB TCW No. 19/2003	Yes / No / N/A	7	Key considerations are shown in Appendix D of this Manual.						
	(2) Construction Programme showing breakdowns of works activities.	Yes / No / N/A	7							
	(3) % float time allowed for the key events.	For (3) to (5), <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Float Time</th> <th>BES(E) Score</th> </tr> </thead> <tbody> <tr> <td>Less than 10% / greater than 30%</td> <td>0%</td> </tr> <tr> <td>10% to 30%</td> <td>7</td> </tr> </tbody> </table>	Float Time	BES(E) Score	Less than 10% / greater than 30%	0%	10% to 30%	7	7	Sufficient, reasonable but not too generous float time should be well provided in the construction period to allow for contingency.
Float Time	BES(E) Score									
Less than 10% / greater than 30%	0%									
10% to 30%	7									
	(4) % float time allowed for required contractor’s design submissions and approval.		7	Project Engineer shall demonstrate that time for contractor’s design submission and approval is allowed for in the programme.						
	(5) % float time allowed for planning, connection and diversion of the utilities services.		7	Project Engineer shall demonstrate that time for necessary diversion of utilities services, including submission, liaison and approval, is allowed for in the programme.						
1.2	Liaison, Documentation and Statutory Approval (Max. 20 BES(E) Score)									
	Make pre-construction arrangements before tender – 8 aspects: -									
	(1) Compliance on statutory requirement in PAH Chapter 4 on design approvals.	Yes / No / N/A	4	Key considerations are shown in Appendix D of this Manual.						
	(2) Adequate site investigation and incorporation of risks in contract documents	Yes / No / N/A	4							
	(3) Latest utilities records are available.	Yes / No / N/A	2							
	(4) Latest topographical survey plans are available.	Yes / No / N/A	2							
	(5) Essential services for construction works are available.	Yes / No / N/A	2							
	(6) Coordination on utility diversion scheme is completed.	Yes / No / N/A	2							
	(7) Sufficient information on demolition works is prepared.	Yes / No / N/A	2							
	(8) Coordination with facility management / maintenance party is conducted	Yes / No / N/A	2							

Item No.	Assessment Items / Aspects	Scoring Method	BES(E) Score Gain [Note 1]	Remarks
1.3	Cross-discipline Design Coordination (Max. 20 BES(E) Score)			
	Establish cross-discipline coordination at design stages – 3 aspects: -			
	(1) Compatible layouts with all disciplines of works incorporated	Yes / No / N/A	7	Key considerations are shown in Appendix D of this Manual.
	(2) Identify and resolve conflicts with services at critical locations	Yes / No / N/A	7	
	(3) Indication of complex interface and construction details in the contract documents.	Yes / No / N/A	6	
1.4	Facilitating Construction (Max. 25 BES(E) Score)			
	The design plan should address key issues for constructability and smooth construction – 6 aspects: -			
	(1) Site constraints are identified and addressed in the design.	Yes / No / N/A	5	Key considerations are shown in Appendix D of this Manual.
	(2) Methodology and sequence of critical work items are assessed and considered.	Yes / No / N/A	4	
	(3) Provision of site access is considered for all work fronts.	Yes / No / N/A	4	
	(4) Reasonably sufficient works areas are provided.	Yes / No / N/A	4	
	(5) Necessary measures of temporary utility arrangements are provided.	Yes / No / N/A	4	
	(6) Facilitating multiple work front construction.	Yes / No / N/A	4	

Module 2 – Site Planning and Usage

Item No.	Assessment Items / Aspects	Scoring Method	BES(E) Score Gain [Note 1]	Remarks
2.1	Site Positioning (Max. 125 BES(E) Score)			
	Option/preliminary study on site position and/or formation level is carried out to: -			
	(1) facilitate construction access and logistics.	Yes / No / N/A	35	Key considerations are shown in Appendix D of this Manual.
	(2) minimize the generation of surplus excavated material.	Yes / No / N/A	18	
	(3) avoid major temporary traffic arrangement.	Yes / No / N/A	18	
	(4) avoid impact on main utilities and structures.	Yes / No / N/A	18	
	(5) facilitate easy access and delivery of sizeable construction plants to the Site and within the site areas.	Yes / No / N/A	18	
	(6) avoid underground works at complex geology or using long piles.	Yes / No / N/A	18	
2.2	Site Utilisation and Accessibility (Max. 125 BES(E) Score)			
	Preliminary/reference design is prepared to justify site layout: -			
	(1) facilitate easy access and installation of sizeable E&M plants with consideration of its maintenance and operations.	Yes / No / N/A	35	Key considerations are shown in Appendix D of this Manual.
	(2) minimize impact on geotechnical features.	Yes / No / N/A	24	
	(3) minimize any temporary slope strengthening in the course of works	Yes / No / N/A	12	
	(4) minimize potential risks due to demolition	Yes / No / N/A	12	
	(5) minimize potential risks due to dredging works	Yes / No / N/A	12	
	(6) minimize extent of tree transplantation / removal in terms of buildability and cost effectiveness – 3 aspects: -			
	(a) Tree felling, transplantation and substantial preservation is not required.	Yes / No / N/A	7	
	(b) No Old and Valuable Trees (OVTs) are impacted	Yes / No / N/A	4	
	(c) General requirements for tree works are met	Yes / No / N/A	4	
	(7) minimize extent of ecological translocation in terms of buildability and cost effectiveness – 4 aspects: -			
	(a) Relocations / translocations of ecological species are not required.	Yes / No / N/A	4	
	(b) No mangroves are impacted.	Yes / No / N/A	4	
	(c) No adverse impacts on marine species (e.g. dolphins, horseshoe crabs, turtles) are generated.	Yes / No / N/A	4	

Item No.	Assessment Items / Aspects	Scoring Method	BES(E) Score Gain [Note 1]	Remarks
	(d) General requirements for protection on ecological species are met.	Yes / No / N/A	3	

Module 3 – Details of Designs – Geotechnical

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks		
3.G1	Slope Works					
	1. Type of slope works					
	(1) No. of types of slope works involved.	No. of types of slope works	Score	20%	For simplification purpose, no. of types of slope works in a project shall be limited to less than six (6) .	
		1 to 2	20%			
		Between 3 and 6	Regressive score from 20% to 0% with interpolation within range			
		6 or above	0%			
	2. Selection of slope works [Imposed Conditions]					
	Total area on projected elevated slopes / retaining structures (sq. m).					
	(1) # Percentage of area on projected elevation – slopes only requiring surface protection (P_{pe1})	Aspect	Formula	40%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (13) should be equal to 100% For the same area of projected elevation involving more than 1 slope works (e.g. slope works consist of both soil slope cutting and soil nailing works in the same area of projected elevation),the assessment item with lower BES(E) Score (i.e. Buildability assessment of soil nailing works) should be assessed.	
		(P_{pe1})	(P_{pe1}) x 40%	38%		
		(2) # Percentage of area on projected elevation – soil cut slopes (P_{pe2})	(P_{pe2})	(P_{pe2}) x 38%		34%
		(3) # Percentage of area on projected elevation – rock cut slopes (P_{pe3})	(P_{pe3})	(P_{pe3}) x 34%		36%
(4) # Percentage of area on projected elevation – slopes with soil nailing works (P_{pe4})		(P_{pe4})	(P_{pe4}) x 36%	30%		
(5) # Percentage of area on projected elevation – fill slopes (P_{pe5})		(P_{pe5})	(P_{pe5}) x 30%	34%		
(6) # Percentage of area on projected elevation – slopes with rock bolts / rock dowels (P_{pe6})		(P_{pe6})	(P_{pe6}) x 34%	24%		
(7) # Percentage of area on projected elevation – slopes involving soil improvement works - bulk improvement (P_{pe7})		(P_{pe7})	(P_{pe7}) x 24%	16%		
(8) # Percentage of area on projected elevation – slopes involving soil improvement works - improvement by pits (P_{pe8})		(P_{pe8})	(P_{pe8}) x 16%	28%		
(9) # Percentage of area on projected elevation – retaining structures without piles (P_{pe9})		(P_{pe9})	(P_{pe9}) x 28%	16%		
(10) # Percentage of area on projected elevation – retaining structures with piles (P_{pe10})		(P_{pe10})	(P_{pe10}) x 16%	20%		
(11) # Percentage of area on projected elevation – reinforced earth wall(P_{pe11})	(P_{pe11})	(P_{pe11}) x 20%				

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
(12)	# Percentage of area on projected elevation – flexible debris resisting barrier (P_{pe12})		16%									
(13)	# Percentage of area on projected elevation – rigid barrier (P_{pe13})		16%									
	Imposed Conditions (ICG1): -	ICG1 = 0.5 x (40% - Sum of Score obtained in (1) to (13))		Users are required to provide the details of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions.								
3. Surface and sub-surface drainage system												
Total length of surface drainage (m)												
(1)	Percentage of length of surface drainage following CEDD / DSD Standard Drawings (P_{sdsd}).	<table border="1"> <thead> <tr> <th>(P_{sdsd})</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>80% or less</td> <td>0</td> </tr> <tr> <td>Between 80% and 100%</td> <td>Progressive score from 0% to 10% with interpolation within range</td> </tr> <tr> <td>100%</td> <td>10%</td> </tr> </tbody> </table>	(P_{sdsd})	Formula	80% or less	0	Between 80% and 100%	Progressive score from 0% to 10% with interpolation within range	100%	10%	10%	For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is.
(P_{sdsd})	Formula											
80% or less	0											
Between 80% and 100%	Progressive score from 0% to 10% with interpolation within range											
100%	10%											
4. Prefabrication												
(1)	Percentage of volume of concrete used for prefabricated retaining wall (P_{rwp}).	<table border="1"> <thead> <tr> <th>Percentage of Prefabricated Retaining Wall (P_{rwp})</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>30% or less</td> <td>0</td> </tr> <tr> <td>Between 30% and 70%</td> <td>Progressive score from 0% to 15% with interpolation within range</td> </tr> <tr> <td>70% or more</td> <td>15%</td> </tr> </tbody> </table>	Percentage of Prefabricated Retaining Wall (P_{rwp})	Formula	30% or less	0	Between 30% and 70%	Progressive score from 0% to 15% with interpolation within range	70% or more	15%	15%	The percentage of prefabricated retaining wall shall be measured in terms of volume of concrete i.e. (Total Volume of concrete in prefabricated elements of retaining wall) / (Total Volume of concrete in retaining wall).
Percentage of Prefabricated Retaining Wall (P_{rwp})	Formula											
30% or less	0											
Between 30% and 70%	Progressive score from 0% to 15% with interpolation within range											
70% or more	15%											
5. Finishes on final appearance												
Total area of projected elevation of final appearance (m ²)												
(1)	# Percentage of area of projected elevation – off-site prefabrication works (P_{ff1}).	<table border="1"> <thead> <tr> <th>Aspect</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{ff1})</td> <td>(P_{ff1}) x 15%</td> </tr> </tbody> </table>	Aspect	Formula	(P_{ff1})	(P_{ff1}) x 15%	15%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is.				
Aspect	Formula											
(P_{ff1})	(P_{ff1}) x 15%											
(2)	# Percentage of area of projected elevation – greening / painting on surfaces (P_{ff2}).		13.5%									

Item No.	Assessment Items / Aspects	Scoring Method		Max. Score % Gain	Remarks
	(3) # Percentage of area of projected elevation – in-situ finishing works other than (1), (2) and (4) (P_{ff3}).	(P_{ff2})	$(P_{ff2}) \times 13.5\%$	3.75%	Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (4) should be equal to 100%.
	(4) # Percentage of area of projected elevation – in-situ profiled finishes on slope and retaining wall. (P_{ff4}).	(P_{ff3})	$(P_{ff3}) \times 3.75\%$	3%	
		(P_{ff4})	$(P_{ff4}) \times 3\%$		
3.G2	Site Formation / Earthworks				
	1. Overall earthworks				
	(1) Percentage of difference, in terms of volume, of cut and fill for site formation works in balance (R_{ct}).	Ratio between estimated cut and estimate fill (R_{ct})	Score	45%	Project Engineer shall provide preliminary estimate for cut and fill volume demonstrating that it is within 40% difference . $R_{ct} = \frac{ \text{Vol.of fill} - \text{Vol.of cut} }{(\text{Vol.of fill} + \text{Vol.of cut})}$
		10% or less	45%		
		Between 10% and 40%	Regressive score from 45% to 0% with interpolation within range		
		40% or more	0		
	2. Excavation / Cuttings				
	(1) # Percentage of volume of excavation – using bulk excavation (P_{ebe}).	Aspect	Formula	30%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Note #: The sum of percentages assigned for aspects (1) to (2) should be equal to 100%.
		(P_{ebe})	$(P_{ebe}) \times 30\%$	21%	
	(2) # Percentage of volume of excavation – using pit-by-pit excavation (P_{epp}).	(P_{epp})	$(P_{epp}) \times 21\%$		
	3. Envisaged extensive excavation or possible excavation and lateral support (ELS) works [Imposed Conditions]				
	(1) Required Excavation Depth for the proposed works (measured from the highest adjacent ground level)	Excavation Depth (m)	Score	25%	User shall consider the anticipated excavation works required for the proposed permanent underground works in the course of design. For simplification purpose, excavation depth is used as a measure. A lower excavation depth shall require a lower extent of ELS works and thereby, awarded with higher score.
		5 or less	25%		
		Between 5 and 15	Regressive score from 25% to 0% with interpolation within range		
		15 or more	0		
	Imposed Conditions (ICG2): -	ICG2 = 0.5 x (25% - Score obtained from (1))			Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions.

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks																		
3.G3	Foundation Works																					
	1. Types of foundations																					
	(1) No. of types of foundations adopted.	<table border="1"> <thead> <tr> <th>No. of Types of Foundations</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25%</td> </tr> <tr> <td>2</td> <td>12.5%</td> </tr> <tr> <td>3 or above</td> <td>0%</td> </tr> </tbody> </table>	No. of Types of Foundations	Score	1	25%	2	12.5%	3 or above	0%	25%	For simplification purpose, no. of types of foundation works in a project shall be limited to less than three (3) .										
No. of Types of Foundations	Score																					
1	25%																					
2	12.5%																					
3 or above	0%																					
	2. Selection of foundations [Imposed Conditions]																					
	Total plan area to be supported by foundation (sq. m).																					
	(1) # Percentage of area supported by shallow foundation (P_{sf1}).	<table border="1"> <thead> <tr> <th>Plan Area of Foundation</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{sf1})</td> <td>$(P_{sf1}) \times 45\%$</td> </tr> <tr> <td>(P_{sf2})</td> <td>$(P_{sf2}) \times 36\%$</td> </tr> <tr> <td>(P_{sf3})</td> <td>$(P_{sf3}) \times 40.5\%$</td> </tr> <tr> <td>(P_{sf4})</td> <td>$(P_{sf4}) \times 27\%$</td> </tr> <tr> <td>(P_{sf5})</td> <td>$(P_{sf5}) \times 31.5\%$</td> </tr> <tr> <td>(P_{sf6})</td> <td>$(P_{sf6}) \times 27\%$</td> </tr> <tr> <td>(P_{sf7})</td> <td>$(P_{sf7}) \times 22.5\%$</td> </tr> <tr> <td>(P_{sf8})</td> <td>$(P_{sf8}) \times 18\%$</td> </tr> </tbody> </table>	Plan Area of Foundation	Formula	(P_{sf1})	$(P_{sf1}) \times 45\%$	(P_{sf2})	$(P_{sf2}) \times 36\%$	(P_{sf3})	$(P_{sf3}) \times 40.5\%$	(P_{sf4})	$(P_{sf4}) \times 27\%$	(P_{sf5})	$(P_{sf5}) \times 31.5\%$	(P_{sf6})	$(P_{sf6}) \times 27\%$	(P_{sf7})	$(P_{sf7}) \times 22.5\%$	(P_{sf8})	$(P_{sf8}) \times 18\%$	45%	<p>For simplification purpose, simpler and easier the proposed works, higher the buildability the project is.</p> <p>Different types of works would contribute different maximum BES(E) Score according to buildability.</p> <p>Note #: The sum of percentages assigned for aspects (1) to (8) should be equal to 100%.</p>
Plan Area of Foundation	Formula																					
(P_{sf1})	$(P_{sf1}) \times 45\%$																					
(P_{sf2})	$(P_{sf2}) \times 36\%$																					
(P_{sf3})	$(P_{sf3}) \times 40.5\%$																					
(P_{sf4})	$(P_{sf4}) \times 27\%$																					
(P_{sf5})	$(P_{sf5}) \times 31.5\%$																					
(P_{sf6})	$(P_{sf6}) \times 27\%$																					
(P_{sf7})	$(P_{sf7}) \times 22.5\%$																					
(P_{sf8})	$(P_{sf8}) \times 18\%$																					
	(2) # Percentage of area supported by flight auger piles (P_{sf2}).	36%																				
	(3) # Percentage of area supported by vertical minipiles (P_{sf3}).	40.5%																				
	(4) # Percentage of area supported by raking piles (P_{sf4}).	27%																				
	(5) # Percentage of area supported by bored piles without bell-out (P_{sf5}).	31.5%																				
	(6) # Percentage of area supported by bored piles with bell-out (P_{sf6}).	27%																				
	(7) # Percentage of area supported by diaphragm wall (P_{sf7}).	22.5%																				
	(8) # Percentage of area supported by other foundation systems (P_{sf8}).	18%																				
	Imposed Conditions (ICG3): -	ICG3 = 0.5 x (45% - Sum of Score obtained from (1) to (8))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the "Remarks" column to address such imposed conditions.																		

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks	
3. Envisaged excavation and lateral support (ELS) system					
(1)	Required Excavation Depth for the proposed works (measured from the highest adjacent ground level)	Excavation Depth (m)	Score	20%	User shall consider the anticipated excavation works required for the proposed permanent underground works in the course of design. For simplification purpose, excavation depth is used as a measure. A lower excavation depth shall require a lower extent of ELS works and thereby, awarded with higher score.
		5 or less	20%		
		Between 5 and 15	Regressive score from 20% to 0% with interpolation within range		
		15 or more	0		
4. Degree of utilization of foundation					
(1)	Minimum degree of utilization, in terms of bearing capacity, in the foundation design.	Degree of Utilisation	Score	10%	Users shall provide relevant calculation pages for the concerned foundation design for completing this assessment items.
		50% or less	0%		
		Between 50% and 85%	Progressive score from 0% to 20% with interpolation within range		
		85% or above	10%		
3.G4 Ground Improvement Works					
1. Types of ground improvement works [Imposed Conditions]					
(1)	No. of types of ground improvement works adopted.	No. of types of Ground Improvement Works	Score	40%	For simplification purpose, no. of types of ground improvement works in a project shall be limited to less than three (3) .
		1	40%		
		2	20%		
		3 or above	0%		
Imposed Conditions (ICG4): -		ICG4 = 0.5 x (40% - Score obtained from (1))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the "Remarks" column to address such imposed conditions.	
2. Selection of ground improvement works					
(1)	# Percentage of volume – soil compaction works (P_{gi1}).			60%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is.
(2)	# Percentage of volume – ground freezing (P_{gi2}).			42%	

Item No.	Assessment Items / Aspects	Scoring Method		Max. Score % Gain	Remarks
	(3) # Percentage of volume – hydraulic ground improvement works (P_{gi3}).	Percentage Volume of Ground Improvement Works	Formula	48%	Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (7) should be equal to 100%.
	(4) # Percentage of volume – chemical grouting (P_{gi4}).			48%	
	(5) # Percentage of volume – inclusion and confinement method (P_{gi5}).	(P_{gi1})	$(P_{gi1}) \times 60\%$	48%	
	(6) # Percentage of volume – stone column (P_{gi6}).	(P_{gi2})	$(P_{gi2}) \times 42\%$	42%	
	(7) # Percentage of volume – deep cement mixing (P_{gi7}).	(P_{gi3})	$(P_{gi3}) \times 48\%$	42%	
		(P_{gi4})	$(P_{gi4}) \times 48\%$		
		(P_{gi5})	$(P_{gi5}) \times 48\%$		
		(P_{gi6})	$(P_{gi6}) \times 42\%$		
		(P_{gi7})	$(P_{gi7}) \times 42\%$		

3.G5 Tunnels, Caverns and Underground Space

1. Types of tunnelling methods

(1) No. of types of tunnelling methods adopted.	No. of types of Tunnel Methods	Score	20%	For simplification purpose, no. of types of ground improvement works in a project shall be limited to less than five (5) .
	1 to 3	20%		
	4	10%		
	5 or above	0%		

2. Selection of tunnelling methods [Imposed Conditions]

Total length of tunnel to be constructed

(1) # Percentage of length of mined tunnel - drill-and-blast (P_{tm1}).	Length of Tunnelling Method	Formula	30%	Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (7) should be equal to 100%.
(2) # Percentage of length - box / pipe jacking (P_{tm2}).			27%	
(3) # Percentage of length - Earth Pressure Balance (EPB) TBM (P_{tm3}).	(P_{tm1})	$(P_{tm1}) \times 30\%$	25.5%	
	(P_{tm2})	$(P_{tm2}) \times 27\%$	24%	
(4) # Percentage of length - slurry TBM (P_{tm4}).	(P_{tm3})	$(P_{tm3}) \times 25.5\%$	18%	
(5) # Percentage of length of mined tunnel - drill-and-break (P_{tm5}).	(P_{tm4})	$(P_{tm4}) \times 24\%$	15%	
(6) # Percentage of length - cut-and-cover tunnel (P_{tm6}).	(P_{tm5})	$(P_{tm5}) \times 18\%$	3%	
(7) # Percentage of length - hand dug tunnel (P_{tm7}).	(P_{tm6})	$(P_{tm6}) \times 15\%$		
		(P_{tm7})	$(P_{tm7}) \times 3\%$	

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
	Imposed Conditions (ICG5): -	ICG5 = 0.5 x (30% - Sum of Score obtained from (1) to (7))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the "Remarks" column to address such imposed conditions.								
3. Type of cross sections												
(1) No. of types of cross sections adopted.	<table border="1"> <thead> <tr> <th>No. of types of Tunnel Cross Sections</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1 to 2</td> <td>10%</td> </tr> <tr> <td>Between 2 and 8</td> <td>Regressive score from 10% to 0% with interpolation within range</td> </tr> <tr> <td>8 or above</td> <td>0%</td> </tr> </tbody> </table>	No. of types of Tunnel Cross Sections	Score	1 to 2	10%	Between 2 and 8	Regressive score from 10% to 0% with interpolation within range	8 or above	0%		10%	For simplification purpose, no. of types of cross sections in a project shall be limited to less than eight (8) .
No. of types of Tunnel Cross Sections	Score											
1 to 2	10%											
Between 2 and 8	Regressive score from 10% to 0% with interpolation within range											
8 or above	0%											
4. Prefabrication of tunnel structures												
(1) Percentage of volume of concrete used for prefabricated tunnel structure.	<table border="1"> <thead> <tr> <th>Percentage Volume of Concrete Used for Prefabricated Tunnel</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>30% or less</td> <td>0%</td> </tr> <tr> <td>Between 30% and 70%</td> <td>Progressive score from 0% to 25% with interpolation within range</td> </tr> <tr> <td>70% or above</td> <td>25%</td> </tr> </tbody> </table>	Percentage Volume of Concrete Used for Prefabricated Tunnel	Score	30% or less	0%	Between 30% and 70%	Progressive score from 0% to 25% with interpolation within range	70% or above	25%		25%	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is. More than 30% of the works shall be prefabricated.
Percentage Volume of Concrete Used for Prefabricated Tunnel	Score											
30% or less	0%											
Between 30% and 70%	Progressive score from 0% to 25% with interpolation within range											
70% or above	25%											
5. Internal finishes												
(A) Percentage of precast unit of overhead ducts, in terms of tunnel length.	For (A) to (E): - <table border="1"> <thead> <tr> <th>Percentage of Item</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>30% or less</td> <td>0%</td> </tr> <tr> <td>Between 30% and 70%</td> <td>Progressive score from 0% to 3% with interpolation within range</td> </tr> <tr> <td>70% or above</td> <td>3%</td> </tr> </tbody> </table>	Percentage of Item	Score	30% or less	0%	Between 30% and 70%	Progressive score from 0% to 3% with interpolation within range	70% or above	3%		3%	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is.
Percentage of Item		Score										
30% or less		0%										
Between 30% and 70%		Progressive score from 0% to 3% with interpolation within range										
70% or above		3%										
(B) Percentage of precast / prefabricated soffit decks / ducts, in terms of tunnel length.		3%										
(C) Percentage of precast unit of walkways, in terms of tunnel length.		3%										
(D) Percentage of ceiling / walls with pre-installed fire protection system, in terms of total required length.		3%										
(E) Percentage of ceiling / walls with pre-installed support and fixing for tunnel accessory, in terms of total required length.		3%										

Module 3 – Details of Designs – Roadworks

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks	
3.R1	Carriageway, Cycletrack and Footpath				
	1. Alignment of Roadworks arising the Following Works				
	(Measured by percentage length)				
	(1) # Percentage of formation / modification of new Slope. (P_{ra1})	Aspect	Formula	80%	For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is. Note #: The sum of percentages assigned for aspects (1) to (5) should be equal to 100%.
	(2) # Percentage of formation / modification of new Retaining Wall. (P_{ra2})	(P_{ra1})	$(P_{ra1}) \times 80\%$	70%	
	(3) # Percentage of formation / modification of new Bridge. (P_{ra3})	(P_{ra2})	$(P_{ra2}) \times 70\%$	50%	
	(4) # Percentage of formation / modification of new Tunnel. (P_{ra4})	(P_{ra3})	$(P_{ra3}) \times 50\%$	40%	
(5) # Percentage of No Major Feature to be formed. (P_{ra5})	(P_{ra4})	$(P_{ra4}) \times 40\%$	100%		
	(P_{ra5})	$(P_{ra5}) \times 100\%$			
Imposed Conditions (ICR1): -		ICR1 = 0.5 x (100% - Sum of Score obtained from (1) to (5))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the "Remarks" column to address such imposed conditions.	
3.R2	Road Furniture				
	1. Standardization of works				
	(1) Percentage of length of profile barriers following HyD standard details.	For (1) to (5):		12%	For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is.
	(2) Percentage of length of beam barriers following HyD standard details.			12%	
	(3) Percentage of length of railings / bollards following HyD standard details.	50% or less	0%	12%	
	(4) Percentage of length of ATC and E&M facilities following HyD standard details.	Between 50% and 100%	Progressive score from 0% to 12% with interpolation within range	12%	
(5) Percentage of length of dwarf wall, planter wall and other landscaping works following HyD standard details.	100%	12%	12%		

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks										
2. Types of road details														
	(1) No. of types of sign post fixing details not following HyD standard details.	For (1) and (2):	20%	For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is.										
	(2) No. of types of joints not following HyD standard details.		<table border="1"> <thead> <tr> <th data-bbox="1145 415 1397 541">No. of Types of Non-standard Details</th> <th data-bbox="1397 415 1679 541">Score</th> </tr> </thead> <tbody> <tr> <td data-bbox="1145 541 1397 604">0 to 1</td> <td data-bbox="1397 541 1679 604">20%</td> </tr> <tr> <td data-bbox="1145 604 1397 667">2</td> <td data-bbox="1397 604 1679 667">10%</td> </tr> <tr> <td data-bbox="1145 667 1397 730">3 or above</td> <td data-bbox="1397 667 1679 730">0%</td> </tr> </tbody> </table>		No. of Types of Non-standard Details	Score	0 to 1	20%	2	10%	3 or above	0%	20%	
No. of Types of Non-standard Details	Score													
0 to 1	20%													
2	10%													
3 or above	0%													
3.R3 Noise Barrier Form														
1. Minimize noise mitigation works [Imposed Conditions]														
Total length of traffic road requiring noise mitigation works														
	(1) # Percentage of length of traffic road – adopt natural features as noise mitigation works (P_{nm1}).	<table border="1"> <thead> <tr> <th data-bbox="1145 930 1397 982">Aspect</th> <th data-bbox="1397 930 1679 982">Formula</th> </tr> </thead> <tbody> <tr> <td data-bbox="1145 982 1397 1045">(P_{nm1})</td> <td data-bbox="1397 982 1679 1045">$(P_{nm1}) \times 30\%$</td> </tr> <tr> <td data-bbox="1145 1045 1397 1108">(P_{nm2})</td> <td data-bbox="1397 1045 1679 1108">$(P_{nm2}) \times 25.5\%$</td> </tr> <tr> <td data-bbox="1145 1108 1397 1171">(P_{nm3})</td> <td data-bbox="1397 1108 1679 1171">$(P_{nm3}) \times 18\%$</td> </tr> <tr> <td data-bbox="1145 1171 1397 1234">(P_{nm4})</td> <td data-bbox="1397 1171 1679 1234">$(P_{nm4}) \times 9\%$</td> </tr> </tbody> </table>	Aspect	Formula	(P_{nm1})	$(P_{nm1}) \times 30\%$	(P_{nm2})	$(P_{nm2}) \times 25.5\%$	(P_{nm3})	$(P_{nm3}) \times 18\%$	(P_{nm4})	$(P_{nm4}) \times 9\%$	30%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Note #: The sum of percentages assigned for aspects (1) to (4) should be equal to 100%.
Aspect	Formula													
(P_{nm1})	$(P_{nm1}) \times 30\%$													
(P_{nm2})	$(P_{nm2}) \times 25.5\%$													
(P_{nm3})	$(P_{nm3}) \times 18\%$													
(P_{nm4})	$(P_{nm4}) \times 9\%$													
	(2) # Percentage of length of traffic road – adopt noise barrier (P_{nm2}).	25.5%												
	(3) # Percentage of length of traffic road – adopt semi noise enclosure (P_{nm3}).	18%												
	(4) # Percentage of length of traffic road – adopt full noise enclosure (P_{nm4}).	9%												
	Imposed Conditions (ICR3): -	ICR3 = 0.5 x (30% - Sum of Score obtained from (1) to (4))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions.										

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
2. Noise mitigation system												
(A) Type of primary frame	No. of variation of horizontal spacing of primary frame.	For (A),	15%	For standardisation purpose, Variation of horizontal spacing of primary frame in a project shall be limited to less than eight (8) .								
(B) Type of structural members	Percentage of majority type of horizontal members.	<table border="1"> <thead> <tr> <th>No. of types of horizontal spacing</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1 to 4</td> <td>15%</td> </tr> <tr> <td>Between 4 and 8</td> <td>Regressive score from 15% to 0% with interpolation within range</td> </tr> <tr> <td>8 or above</td> <td>0%</td> </tr> </tbody> </table>	No. of types of horizontal spacing		Score	1 to 4	15%	Between 4 and 8	Regressive score from 15% to 0% with interpolation within range	8 or above	0%	7.5%
No. of types of horizontal spacing	Score											
1 to 4	15%											
Between 4 and 8	Regressive score from 15% to 0% with interpolation within range											
8 or above	0%											
	Percentage of majority type of vertical members.	<table border="1"> <thead> <tr> <th>Percentage of majority type of members</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>60% or less</td> <td>0%</td> </tr> <tr> <td>Between 60% and 85%</td> <td>Progressive score from 0% to 7.5% with interpolation within range</td> </tr> <tr> <td>85% or above</td> <td>7.5%</td> </tr> </tbody> </table>	Percentage of majority type of members	Score	60% or less	0%	Between 60% and 85%	Progressive score from 0% to 7.5% with interpolation within range	85% or above	7.5%	7.5%	
Percentage of majority type of members	Score											
60% or less	0%											
Between 60% and 85%	Progressive score from 0% to 7.5% with interpolation within range											
85% or above	7.5%											
		For (B),										
3. Type of noise barrier panels												
(1)	No. of types of noise barrier panel modules adopted, excluding firebreak and end panels.	<table border="1"> <thead> <tr> <th>No. of types of noise barrier panel</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1 to 4</td> <td>20%</td> </tr> <tr> <td>Between 4 and 8</td> <td>Regressive score from 20% to 0% with interpolation within range</td> </tr> <tr> <td>8 or above</td> <td>0%</td> </tr> </tbody> </table>	No. of types of noise barrier panel	Score	1 to 4	20%	Between 4 and 8	Regressive score from 20% to 0% with interpolation within range	8 or above	0%	20%	For standardisation purpose, no. of types of noise barrier panel modules (excluding end panels) in a project shall be limited to less than eight (8) .
No. of types of noise barrier panel	Score											
1 to 4	20%											
Between 4 and 8	Regressive score from 20% to 0% with interpolation within range											
8 or above	0%											
4. Reinforced concrete detailing												
(1)	Degree of satisfaction of reinforcement detailing to facilitate rebar fixing (%).	For (1) and (2), % Gained = % input x 8%	8%	Reinforcement details shall be taken into account to facilitate the construction works on site, including delivery, handling, and installation. Project Engineer shall assess five (5) most critical locations and average the result based on their experience.								
(2)	Degree of satisfaction of reinforcement detailing to facilitate concreting (%).		8%									

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks
(3)	Degree of standardization of reinforcement detailing of similar size, span and loading (%).	For (3), % Gained = % input x 4%	4%	Project Engineer could assess the degree of compliance and provide the appropriate BES(E) Score in each aspect. For composite structures, Users should consider the majority of structural materials (either steelworks or reinforced concrete) by means of volume.
5. Structural steelworks detailing				
(1)	Degree of compliance for detailing taking into account of prefabrication, delivery and erection (%).	For (1), % Gained = % input x 4%	4%	Structural steelworks details shall take into account to facilitate the construction works on site, including delivery, handling, and installation. Project Engineer shall assess five (5) most critical locations and average the result based on their experience. Project Engineer could assess the degree of compliance and provide the appropriate BES(E) Score in each aspect. For composite structures, Users should consider the majority of structural materials (either steelworks or reinforced concrete) by means of volume.
(2)	Degree of compliance for minimizing temporary works on site (%).	For (2) and (3), % Gained = % input x 3%	3%	
(3)	Degree of compliance for minimizing on-site welding by efficient bolted connection system (%).		3%	
(4)	Degree of compliance for detailing taking into account of locations and constraints of on-site connection (%).	For (4) to (8), % Gained = % input x 2%	2%	
(5)	Degree of compliance for eliminating built-up sections (%).		2%	
(6)	Degree of compliance for specifying steel sections commonly available in the market (%).		2%	
(7)	Degree of compliance for incorporating interface requirements from other disciplines (%).		2%	
(8)	Degree of compliance for avoiding connections at critical / complex sections (%).		2%	

Module 3 – Details of Designs – Drainage Works

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks																
3.D1	Pipelines																			
	1. Types of construction method																			
	(1) No. of types of construction method.	<table border="1"> <thead> <tr> <th>No. of types of Construction Method</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1 and 2</td> <td>25%</td> </tr> <tr> <td>3</td> <td>12.5%</td> </tr> <tr> <td>4 or above</td> <td>0%</td> </tr> </tbody> </table>	No. of types of Construction Method	Score	1 and 2	25%	3	12.5%	4 or above	0%	25%	For simplification purpose, no. of types of construction projects in a project shall be limited to less than four (4) .								
No. of types of Construction Method	Score																			
1 and 2	25%																			
3	12.5%																			
4 or above	0%																			
	2. Selection of construction method [Imposed Conditions] ^(Note 10)																			
	Total length of pipe to be constructed / rehabilitated																			
	(1) # Percentage of length – minor open trench excavation (by planking or minor shoring) / close fit lining method (e.g. fold and form) (P_{pcm1}).	<table border="1"> <thead> <tr> <th>Aspect</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{pcm1})</td> <td>$(P_{pcm1}) \times 25\%$</td> </tr> <tr> <td>(P_{pcm2})</td> <td>$(P_{pcm2}) \times (-50\%)$</td> </tr> <tr> <td>$(P_{pcm3})$</td> <td>$(P_{pcm3}) \times (-50\%)$</td> </tr> <tr> <td>$(P_{pcm4})$</td> <td>$(P_{pcm4}) \times (-88\%)$</td> </tr> <tr> <td>$(P_{pcm5})$</td> <td>$(P_{pcm5}) \times (-25\%)$</td> </tr> <tr> <td>$(P_{pcm6})$</td> <td>$(P_{pcm6}) \times (-50\%)$</td> </tr> <tr> <td>$(P_{pcm7})$</td> <td>$(P_{pcm7}) \times (-100\%)$</td> </tr> </tbody> </table>	Aspect	Formula	(P_{pcm1})	$(P_{pcm1}) \times 25\%$	(P_{pcm2})	$(P_{pcm2}) \times (-50\%)$	(P_{pcm3})	$(P_{pcm3}) \times (-50\%)$	(P_{pcm4})	$(P_{pcm4}) \times (-88\%)$	(P_{pcm5})	$(P_{pcm5}) \times (-25\%)$	(P_{pcm6})	$(P_{pcm6}) \times (-50\%)$	(P_{pcm7})	$(P_{pcm7}) \times (-100\%)$	25%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (7) should be equal to 100%.
Aspect	Formula																			
(P_{pcm1})	$(P_{pcm1}) \times 25\%$																			
(P_{pcm2})	$(P_{pcm2}) \times (-50\%)$																			
(P_{pcm3})	$(P_{pcm3}) \times (-50\%)$																			
(P_{pcm4})	$(P_{pcm4}) \times (-88\%)$																			
(P_{pcm5})	$(P_{pcm5}) \times (-25\%)$																			
(P_{pcm6})	$(P_{pcm6}) \times (-50\%)$																			
(P_{pcm7})	$(P_{pcm7}) \times (-100\%)$																			
	(2) # Percentage of length – ELS works (P_{pcm2}).																			
	(3) # Percentage of length – trenchless excavation - pipe jacking (P_{pcm3}).																			
	(4) # Percentage of length – trenchless excavation – TBM (P_{pcm4}).																			
	(5) # Percentage of length of pipe rehabilitation – cured-in-place pipe (e.g. CIPP) (P_{pcm5}).																			
	(6) # Percentage of length of pipe rehabilitation – spiral-wound linings (P_{pcm6}).																			
	(7) # Percentage of length – horizontal directional drilling (P_{pcm7}).																			
	Imposed Conditions (ICD1): -	ICD1 = 0.5 x (25% - Sum of Score obtained from (1) to (7))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions.																

Item No.	Assessment Items / Aspects	Scoring Method		Max. Score % Gain	Remarks
3. Types of pipe materials					
(1)	No. of types of pipe materials.	No. of types of pipe materials	Score	25%	For standardisation purpose, no. of types of pipe materials in a project shall be limited to less than four (4) .
		1 and 2	25%		
		3	12.5%		
		4 or above	0%		
4. Selection of pipe materials					
Total length of pipe to be constructed / rehabilitated (m)					
(1)	# Percentage of length – concrete pipes (P_{pm1}).	Aspect	Formula	20%	For simplification purpose, the pipe materials shall be chosen carefully with due consideration of ease of handling, installation and future maintenance. Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (13) should be equal to 100%.
		(P_{pm1})	$(P_{pm1}) \times 20\%$	19%	
		(P_{pm2})	$(P_{pm2}) \times 19\%$	19%	
		(P_{pm3})	$(P_{pm3}) \times 19\%$	19%	
		(P_{pm4})	$(P_{pm4}) \times 19\%$	16%	
		(P_{pm5})	$(P_{pm5}) \times 16\%$	16%	
		(P_{pm6})	$(P_{pm6}) \times 16\%$	16%	
		(P_{pm7})	$(P_{pm7}) \times 16\%$	14%	
		(P_{pm8})	$(P_{pm8}) \times 14\%$	12%	
		(P_{pm9})	$(P_{pm9}) \times 12\%$	8%	
		(P_{pm10})	$(P_{pm10}) \times 8\%$	20%	
		(P_{pm11})	$(P_{pm11}) \times 20\%$	18%	
		(P_{pm12})	$(P_{pm12}) \times 18\%$	16%	
(12)	# Percentage of length of rehabilitated pipe – liner pipes (fabric tube) (P_{pm12}).	(P_{pm13})	$(P_{pm13}) \times 16\%$	16%	
(13)	# Percentage of length of rehabilitated pipe – spirally-wound liners (PVC liner strips) (P_{pm13}).				

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks																				
5. Affected traffic road																								
	Extent of road traffic affected by the works	<table border="1"> <thead> <tr> <th data-bbox="1142 296 1418 422">% obtained with consideration of criteria in Notes</th> <th data-bbox="1418 296 1703 422">Score</th> </tr> </thead> <tbody> <tr> <td data-bbox="1142 422 1418 485">50% or less</td> <td data-bbox="1418 422 1703 485">5%</td> </tr> <tr> <td data-bbox="1142 485 1418 642">Between 50% and 90%</td> <td data-bbox="1418 485 1703 642">Regressive score from 5% to 0% with interpolation within range</td> </tr> <tr> <td data-bbox="1142 642 1418 705">90% or more</td> <td data-bbox="1418 642 1703 705">0%</td> </tr> </tbody> </table>	% obtained with consideration of criteria in Notes	Score	50% or less	5%	Between 50% and 90%	Regressive score from 5% to 0% with interpolation within range	90% or more	0%	5%	<p>% input shall be the sum of the following criteria:</p> <table border="1"> <thead> <tr> <th data-bbox="1973 352 2457 415">Road Status</th> <th data-bbox="2457 352 2783 415">% input added</th> </tr> </thead> <tbody> <tr> <td data-bbox="1973 415 2457 699"> Carriageway of Trunk Road or Primary Distributor <i>(known as Category (i) in Section 2 of Excavation Permit Processing Manual)</i> Special Areas as specified by TD / HyD </td> <td data-bbox="2457 415 2783 699"> +5% for one location +30% for more than or equal to 6 locations </td> </tr> <tr> <td data-bbox="1973 699 2457 867"> Carriageway of road other than Category (i) as specified above </td> <td data-bbox="2457 699 2783 867"> Percentage of concerned works sections x 40% </td> </tr> <tr> <td data-bbox="1973 867 2457 1035"> Footpath and Cycle Track </td> <td data-bbox="2457 867 2783 1035"> Percentage of concerned works sections x 10% </td> </tr> <tr> <td data-bbox="1973 1035 2457 1150"> Works away from carriageway, footpath and cycle track </td> <td data-bbox="2457 1035 2783 1150"> 0% </td> </tr> <tr> <td data-bbox="1973 1150 2457 1413"> Other considerations: (i) Adjacent to MTRCL facilities (ii) Subject to road opening restrictions / repeated opening </td> <td data-bbox="2457 1150 2783 1413"> (i) +5% for each area, max. +10% (ii) +2% for each area, max. +10% </td> </tr> </tbody> </table>	Road Status	% input added	Carriageway of Trunk Road or Primary Distributor <i>(known as Category (i) in Section 2 of Excavation Permit Processing Manual)</i> Special Areas as specified by TD / HyD	+5% for one location +30% for more than or equal to 6 locations	Carriageway of road other than Category (i) as specified above	Percentage of concerned works sections x 40%	Footpath and Cycle Track	Percentage of concerned works sections x 10%	Works away from carriageway, footpath and cycle track	0%	Other considerations: (i) Adjacent to MTRCL facilities (ii) Subject to road opening restrictions / repeated opening	(i) +5% for each area, max. +10% (ii) +2% for each area, max. +10%
% obtained with consideration of criteria in Notes	Score																							
50% or less	5%																							
Between 50% and 90%	Regressive score from 5% to 0% with interpolation within range																							
90% or more	0%																							
Road Status	% input added																							
Carriageway of Trunk Road or Primary Distributor <i>(known as Category (i) in Section 2 of Excavation Permit Processing Manual)</i> Special Areas as specified by TD / HyD	+5% for one location +30% for more than or equal to 6 locations																							
Carriageway of road other than Category (i) as specified above	Percentage of concerned works sections x 40%																							
Footpath and Cycle Track	Percentage of concerned works sections x 10%																							
Works away from carriageway, footpath and cycle track	0%																							
Other considerations: (i) Adjacent to MTRCL facilities (ii) Subject to road opening restrictions / repeated opening	(i) +5% for each area, max. +10% (ii) +2% for each area, max. +10%																							
3.D2 Manholes, Catchpits and Other Drainage Facilities																								
1. Standardization of manholes and catchpits																								
	(1) Total number of manholes and catchpits (2) Percentage of manholes and catchpits following DSD / CEDD standard details (P_{mcs}).	<table border="1"> <thead> <tr> <th data-bbox="1142 1602 1418 1665">(P_{mcs})</th> <th data-bbox="1418 1602 1703 1665">Formula</th> </tr> </thead> <tbody> <tr> <td data-bbox="1142 1665 1418 1728">50% or less</td> <td data-bbox="1418 1665 1703 1728">0</td> </tr> <tr> <td data-bbox="1142 1728 1418 1885">Between 50% and 100%</td> <td data-bbox="1418 1728 1703 1885">Progressive score from 0% to 30% with interpolation within range</td> </tr> <tr> <td data-bbox="1142 1885 1418 1942">100%</td> <td data-bbox="1418 1885 1703 1942">30%</td> </tr> </tbody> </table>	(P_{mcs})	Formula	50% or less	0	Between 50% and 100%	Progressive score from 0% to 30% with interpolation within range	100%	30%	30% *	<p>For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is.</p> <p>* The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.D2(3).</p>												
(P_{mcs})	Formula																							
50% or less	0																							
Between 50% and 100%	Progressive score from 0% to 30% with interpolation within range																							
100%	30%																							

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks
2. Prefabrication of manholes and catchpits [Imposed Conditions]				
(1) Total number of manholes.		(P_{pmc})	Score	25% * For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.D2(3).
(2) Percentage of pre-cast manholes and catchpits (P_{pmc}).		0%	0%	
		Between 0% and 50%	Progressive score from 0% to 25% * with interpolation within range	
		50% or more	25% *	
Imposed Conditions (ICD2): -		ICD2 = 0.5 x (25% - Score obtained from (2)) *		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the "Remarks" column to address such imposed conditions. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.D2(3).
3. Standardization of other drainage facilities				
(A) Sand trap				
Total number of types of sand trap [Note 2]				15% * For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.D2(3).
Percentage of type of sand trap following DSD / CEDD standard details (P_{sts}).		(P_{sts})	Score	
		75% or less	0%	
		Between 75% and 90%	Progressive score from 0% to 15% * with interpolation within range	
		90% or more	15% *	
(B) Manhole cover				
Total number of types of manhole cover [Note 2]				15% * For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.D2(3).
Percentage of type of manhole cover following DSD / CEDD standard details (P_{cos}).		(P_{cos})	Score	
		75% or less	0%	
		Between 75% and 90%	Progressive score from 0% to 15% * with interpolation within range	
		90% or more	15% *	

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks
	(C) Step iron and access ladder			
	Total number of types of step iron and access ladder [Note 2]	(P_{als})	Score	15% * For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.D2(3).
	Percentage of type of step iron and access ladder following DSD / CEDD standard details (P_{als}).	75% or less	0%	
		Between 75% and 90%	Progressive score from 0% to 15% * with interpolation within range	
		90% or more	15% *	
3.D3	Box Culverts			
	1. Types of construction method			
	(1) No. of Types of Construction Method.	No. of types of Construction Method	Score	30% For standardisation purpose, no. of types of construction method in a project shall be limited to less than four (4) .
		1 and 2	30%	
		3	15%	
		4 or above	0%	
	2. Selection of construction method [Imposed Conditions]			
	Total length of box culvert to be constructed (m)			
	(1) # Percentage of length – minor open trench excavation (by planking or minor shoring) (P_{bcm1}).	Aspect	Formula	30% For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (6) should be equal to 100%.
	(2) # Percentage of length – ELS works (P_{bcm2}).	(P_{bcm1})	(P _{bcm1}) x 30%	
	(3) # Percentage of length – mined tunnel method (P_{bcm3}).	(P_{bcm2})	(P _{bcm2}) x 24%	
	(4) # Percentage of length – lining works inside existing pipelines (P_{bcm4}).	(P_{bcm3})	(P _{bcm3}) x 24%	
	(5) # Percentage of length – trenchless excavation – TBM / pipe jacking (P_{bcm5})	(P_{bcm4})	(P _{bcm4}) x 24%	
		(P_{bcm5})	(P _{bcm5}) x 21%	21%

Item No.	Assessment Items / Aspects	Scoring Method		Max. Score % Gain	Remarks
(6)	# Percentage of length – other trenchless excavation method (P_{bcm6}).	(P_{bcm6})	$(P_{bcm6}) \times 15\%$	15%	
Imposed Conditions (ICD3): -		ICD3 = 0.5 x (30% - Sum of Score obtained from (1) to (6))			Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions.
3. Types of cross section of box culvert					
(1)	No. of types of cross section of box culvert.	No. of types of cross section	Score	20%	For standardisation purpose, no. of types of cross section of box culvert in a project shall be limited to less than eight (8) .
		1 and 2	20%		
		Between 2 to 8	Regressive score from 20% to 0% with interpolation within range		
		8 or above	0%		
4. Prefabrication of box culvert					
(1)	Percentage of length of precast box culvert to be constructed (P_{bcp}).	(P_{bcp})	Score	20%	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is.
		10% or less	0%		
		Between 10% and 50%	Progressive score from 0% to 20% with interpolation within range		
		50% or more	20%		
3.D4 Nullahs, Engineered Channels and River Training Works					
1. Simplification of works					
(1)	No. of types of cross section of nullahs, engineered channels and river training works.	For (1)		25%	For standardisation purpose, no. of types of cross section in a project shall be limited to less than eight (8) .
(2)	No. of types of embankment linings.	No. of types of cross section	Score	25%	
(3)	No. of types of channel bed linings.	1 and 2	25%	25%	
		Between 2 to 8	Regressive score from 25% to 0% with interpolation within range		

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks										
		<table border="1"> <tr> <td>8 or above</td> <td>0%</td> </tr> </table> <p>For (2) and (3)</p> <table border="1"> <thead> <tr> <th>No. of types of linings</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1 and 2</td> <td>25%</td> </tr> <tr> <td>3</td> <td>12.5%</td> </tr> <tr> <td>4 or above</td> <td>0%</td> </tr> </tbody> </table>	8 or above	0%	No. of types of linings	Score	1 and 2	25%	3	12.5%	4 or above	0%		
8 or above	0%													
No. of types of linings	Score													
1 and 2	25%													
3	12.5%													
4 or above	0%													
2. Prefabrication of nullahs, engineered channels and river training works [Imposed Conditions]														
Total length of nullahs, engineered channels and river training works (m)														
(1)	Percentage of length of precast / prefabricated nullahs, engineered channels and river training works (P_{nup}).	<table border="1"> <thead> <tr> <th>(P_{nup})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>10% or less</td> <td>0%</td> </tr> <tr> <td>Between 10% and 50%</td> <td>Progressive score from 0% to 25% with interpolation within range</td> </tr> <tr> <td>50% or more</td> <td>25%</td> </tr> </tbody> </table>	(P_{nup})	Score	10% or less	0%	Between 10% and 50%	Progressive score from 0% to 25% with interpolation within range	50% or more	25%	25%	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is.		
(P_{nup})	Score													
10% or less	0%													
Between 10% and 50%	Progressive score from 0% to 25% with interpolation within range													
50% or more	25%													
	Imposed Conditions (ICD4): -	ICD4 = 0.5 x (25% - Score obtained from (1))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the "Remarks" column to address such imposed conditions.										

Module 3 – Details of Designs – Water Works

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
3.W1	Pipelines											
	1. Adoption of pipe materials											
(1)	Compliance of pipe materials and design standard in accordance with WSD Civil Engineering Design Manual or relevant standard details on pipeworks for district cooling system.	<table border="1"> <thead> <tr> <th>Degree of Compliance</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>85% or less</td> <td>0%</td> </tr> <tr> <td>Between 85% and 100%</td> <td>Progressive score from 0% to 16% * with interpolation within range</td> </tr> <tr> <td>100%</td> <td>16% *</td> </tr> </tbody> </table>	Degree of Compliance	Score	85% or less	0%	Between 85% and 100%	Progressive score from 0% to 16% * with interpolation within range	100%	16% *	16% *	For standardization purpose, all pipe materials shall be in accordance with WSD Civil Engineering Design Manual. Similarly for district cooling system pipeworks. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items 3.W1(2) and (3).
Degree of Compliance	Score											
85% or less	0%											
Between 85% and 100%	Progressive score from 0% to 16% * with interpolation within range											
100%	16% *											
	2. Valve chambers [Imposed Conditions]											
	Total number of valve chambers to be constructed [Note 2]											
(1)	Percentage of valve chambers following WSD standard details / combined value chambers (P_{vcs}).	<table border="1"> <thead> <tr> <th>(P_{vcs})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>85% or less</td> <td>0%</td> </tr> <tr> <td>Between 85% and 100%</td> <td>Progressive score from 0% to 17% * with interpolation within range</td> </tr> <tr> <td>100%</td> <td>17% *</td> </tr> </tbody> </table>	(P_{vcs})	Score	85% or less	0%	Between 85% and 100%	Progressive score from 0% to 17% * with interpolation within range	100%	17% *	17% *	For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.W1(3).
(P_{vcs})	Score											
85% or less	0%											
Between 85% and 100%	Progressive score from 0% to 17% * with interpolation within range											
100%	17% *											
	Imposed Conditions (ICW1.1): -	ICW1.1 = 0.5 x (17% * - Score obtained from 2.(1))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions. . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.W1(3).								
	3. Thrust blocks											
	Total number of thrust blocks to be constructed [Note 2]											
(1)	Percentage of thrust blocks following WSD standard details thrust block for 3-dimensional bends (P_{tbs}).	<table border="1"> <thead> <tr> <th>(P_{tbs})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>85% or less</td> <td>0%</td> </tr> <tr> <td>Between 85% and 100%</td> <td>Progressive score from 0% to 17% * with</td> </tr> </tbody> </table>	(P_{tbs})	Score	85% or less	0%	Between 85% and 100%	Progressive score from 0% to 17% * with	17% *	For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.W1(2).		
(P_{tbs})	Score											
85% or less	0%											
Between 85% and 100%	Progressive score from 0% to 17% * with											

Item No.	Assessment Items / Aspects	Scoring Method		Max. Score % Gain	Remarks
			interpolation within range		
		100%	17% *		
4. Types of construction method					
(1)	No. of types of construction method.	No. of types of construction method	Score	20% *	For standardisation purpose, no. of types of construction methods in a project shall be limited to less than six (6) . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items 3.W1(2) and (3).
		1 and 2	20% *		
		Between 3 and 6	Regressive score from 20% * to 0% with interpolation within range		
		6 or above	0%		
5. Selection of construction method [Imposed Conditions]					
Total length of pipe to be constructed (m)					
(1)	# Percentage of length – open trench method or lining method (P_{wcm1}).	Aspect	Formula	20% *	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (4) should be equal to 100%. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items 3.W1(2) and (3).
(2)	# Percentage of length – trenchless excavation (P_{wcm2}).	(P_{wcm1})	$(P_{wcm1}) \times 20\%$		
(3)	# Percentage of length – pipe bursting (P_{wcm3}).	(P_{wcm2})	$(P_{wcm2}) \times (-80\%)$		
(4)	# Percentage of length – other methods (P_{wcm4}).	(P_{wcm3})	$(P_{wcm3}) \times (-60\%)$		
		(P_{wcm4})	$(P_{wcm4}) \times (-80\%)$		
		The minimum BES(E) score in this assessment item is 0.			
	Imposed Conditions (ICW1.2): -	ICW1.2 = 0.5 x (20% * - Sum of Score obtained from (1) to (4))			Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items 3.W1(2) and (3).

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks																				
	<p>6. Affected traffic road</p> <p>Extent of road traffic affected by the works</p>	<table border="1"> <thead> <tr> <th data-bbox="1145 310 1406 436">% obtained with consideration of criteria in Notes</th> <th data-bbox="1406 310 1679 436">Score</th> </tr> </thead> <tbody> <tr> <td data-bbox="1145 436 1406 499">50% or less</td> <td data-bbox="1406 436 1679 499">10% *</td> </tr> <tr> <td data-bbox="1145 499 1406 657">Between 50% and 90%</td> <td data-bbox="1406 499 1679 657">Regressive score from 10% * to 0% with interpolation within range</td> </tr> <tr> <td data-bbox="1145 657 1406 720">90% or more</td> <td data-bbox="1406 657 1679 720">0%</td> </tr> </tbody> </table>	% obtained with consideration of criteria in Notes	Score	50% or less	10% *	Between 50% and 90%	Regressive score from 10% * to 0% with interpolation within range	90% or more	0%	<p>10% *</p>	<p>% input shall be the sum of the following criteria:</p> <table border="1"> <thead> <tr> <th data-bbox="1926 369 2407 432">Road Status</th> <th data-bbox="2407 369 2718 432">% input added</th> </tr> </thead> <tbody> <tr> <td data-bbox="1926 432 2407 716"> Carriageway of Trunk Road or Primary Distributor <i>(known as Category (i) in Section 2 of Excavation Permit Processing Manual)</i> Special Areas as specified by TD / HyD </td> <td data-bbox="2407 432 2718 716"> +5% for one location +30% for more than or equal to 6 locations </td> </tr> <tr> <td data-bbox="1926 716 2407 890"> Carriageway of road other than Category (i) as specified above </td> <td data-bbox="2407 716 2718 890"> Percentage of concerned works sections x 40% </td> </tr> <tr> <td data-bbox="1926 890 2407 1064"> Footpath and Cycle Track </td> <td data-bbox="2407 890 2718 1064"> Percentage of concerned works sections x 10% </td> </tr> <tr> <td data-bbox="1926 1064 2407 1199"> Works away from carriageway, footpath and cycle track </td> <td data-bbox="2407 1064 2718 1199"> 0% </td> </tr> <tr> <td data-bbox="1926 1199 2407 1465"> Other considerations: (i) Adjacent to MTRCL facilities (ii) Subject to Road opening restrictions / repeated opening </td> <td data-bbox="2407 1199 2718 1465"> (i) +5% for each area, max. +10% (ii) +2% for each area, max. +10% </td> </tr> </tbody> </table> <p>* The maximum % gain would be adjusted if N/A cases are identified in aspects in Items 3.W1(2) and (3).</p>	Road Status	% input added	Carriageway of Trunk Road or Primary Distributor <i>(known as Category (i) in Section 2 of Excavation Permit Processing Manual)</i> Special Areas as specified by TD / HyD	+5% for one location +30% for more than or equal to 6 locations	Carriageway of road other than Category (i) as specified above	Percentage of concerned works sections x 40%	Footpath and Cycle Track	Percentage of concerned works sections x 10%	Works away from carriageway, footpath and cycle track	0%	Other considerations: (i) Adjacent to MTRCL facilities (ii) Subject to Road opening restrictions / repeated opening	(i) +5% for each area, max. +10% (ii) +2% for each area, max. +10%
% obtained with consideration of criteria in Notes	Score																							
50% or less	10% *																							
Between 50% and 90%	Regressive score from 10% * to 0% with interpolation within range																							
90% or more	0%																							
Road Status	% input added																							
Carriageway of Trunk Road or Primary Distributor <i>(known as Category (i) in Section 2 of Excavation Permit Processing Manual)</i> Special Areas as specified by TD / HyD	+5% for one location +30% for more than or equal to 6 locations																							
Carriageway of road other than Category (i) as specified above	Percentage of concerned works sections x 40%																							
Footpath and Cycle Track	Percentage of concerned works sections x 10%																							
Works away from carriageway, footpath and cycle track	0%																							
Other considerations: (i) Adjacent to MTRCL facilities (ii) Subject to Road opening restrictions / repeated opening	(i) +5% for each area, max. +10% (ii) +2% for each area, max. +10%																							

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
3.W2	Service Reservoirs: -											
	Design of service reservoirs											
	Compliance of design of service reservoir in accordance with WSD Civil Engineering Design Manual.	<table border="1"> <thead> <tr> <th>Degree of Compliance</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>85% or less</td> <td>0%</td> </tr> <tr> <td>Between 85% and 100%</td> <td>Progressive score from 0% to 10% * with interpolation within range</td> </tr> <tr> <td>100%</td> <td>10% *</td> </tr> </tbody> </table>	Degree of Compliance	Score	85% or less	0%	Between 85% and 100%	Progressive score from 0% to 10% * with interpolation within range	100%	10% *	10% *	<p>For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is.</p> <p>* The maximum % gain would be adjusted if N/A cases are identified in aspects in Items 3.W2(2) and (3).</p>
Degree of Compliance	Score											
85% or less	0%											
Between 85% and 100%	Progressive score from 0% to 10% * with interpolation within range											
100%	10% *											
	1a. Uniform / Minimize structural grid types - along x direction											
	Total number of column grids along x direction	<table border="1"> <thead> <tr> <th>(N_{trgx})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>75% or less</td> <td>15% *</td> </tr> <tr> <td>Between 75% and 85%</td> <td>Regressive score from 15% * to 0% with interpolation within range</td> </tr> <tr> <td>85% or more</td> <td>0%</td> </tr> </tbody> </table>	(N _{trgx})	Score	75% or less	15% *	Between 75% and 85%	Regressive score from 15% * to 0% with interpolation within range	85% or more	0%	15% *	<p>For standardisation purpose, no. of types of column grid in a project shall be limited to less than 85% of total no. of column grid.</p> <p>* The maximum % gain would be adjusted if N/A cases are identified in aspects in Items 3.W2(2) and (3).</p>
(N _{trgx})	Score											
75% or less	15% *											
Between 75% and 85%	Regressive score from 15% * to 0% with interpolation within range											
85% or more	0%											
(1)	Ratio between no. of column grid type along x direction to total number of column grids (%) (N _{trgx}).											
	1b. Uniform / Minimize structural grid types - along y direction											
	Total number of column grids along y direction	<table border="1"> <thead> <tr> <th>(P_{trgy})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>75% or less</td> <td>15% *</td> </tr> <tr> <td>Between 75% and 85%</td> <td>Regressive score from 15% * to 0% with interpolation within range</td> </tr> <tr> <td>85% or more</td> <td>0%</td> </tr> </tbody> </table>	(P _{trgy})	Score	75% or less	15% *	Between 75% and 85%	Regressive score from 15% * to 0% with interpolation within range	85% or more	0%	15% *	<p>For standardisation purpose, no. of column grid type in a project shall be limited to less than 85% of total no. of column grid.</p> <p>* The maximum % gain would be re-distributed if N/A cases are identified in aspects in Items 3.W2(2) and (3).</p>
(P _{trgy})	Score											
75% or less	15% *											
Between 75% and 85%	Regressive score from 15% * to 0% with interpolation within range											
85% or more	0%											
(1)	Ratio between no. of column grid type along y direction to total number of column grids (%) (P _{trgy}).											

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks
2. Uniform / Minimize column types				
	Total number of columns proposed [Note 2]	(P_{trc})	Score	20% * For standardisation purpose, no. of types of column size in a project shall be limited to less than 70% . * The maximum % gain would be re-distributed if N/A cases are identified in aspects in Item 3.W2(3).
(1)	Ratio between no. of types of column size to total number of columns (P_{trc}).	30% or less	20% *	
		Between 30% and 70%	Regressive score from 20% * to 0% with interpolation within range	
		70% or more	0%	
3. Uniform / Minimize footing types				
	Total number of footings proposed [Note 2]	(P_{trf})	Score	20% * For standardisation purpose, no. of types of footing size in a project shall be limited to less than 70% . * The maximum % gain would be re-distributed if N/A cases are identified in aspects in Item 3.W2(2).
(1)	Ratio between no. of types of footing size to total number of footings (P_{trf}).	30% or less	20% *	
		Between 30% and 70%	Regressive score from 20% * to 0% with interpolation within range	
		70% or more	0%	
4. Uniform / Minimize wall panel types				
	Total number of wall panels proposed	(P_{trw})	Score	20% * For standardisation purpose, no. of types of wall panel size in a project shall be limited to less than 70% . * The maximum % gain would be re-distributed if N/A cases are identified in aspects in Items 3.W2(2) and (3).
(1)	Ratio between no. of types of wall panel size to total number of wall panels (P_{trw}).	30% or less	20% *	
		Between 30% and 70%	Regressive score from 20% * to 0% with interpolation within range	
		70% or more	0%	

Module 3 – Details of Designs – Marine Works

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks												
3.M1	Land Reclamation:-															
	Land reclamation is the sum of the reclamation for the seawall and the main platform															
	1. Land reclamation platform level															
(1)	Height of reclamation level being higher than required taking into account all valid considerations.	<table border="1"> <thead> <tr> <th>Height of Reclamation Level (in m) higher than Required</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>0.5m or less</td> <td>30%</td> </tr> <tr> <td>Between 0.5m and 2m</td> <td>Regressive score from 30% to 0% with interpolation within range</td> </tr> <tr> <td>2m or more</td> <td>0%</td> </tr> </tbody> </table>	Height of Reclamation Level (in m) higher than Required	Score	0.5m or less	30%	Between 0.5m and 2m	Regressive score from 30% to 0% with interpolation within range	2m or more	0%	30%	Over-conservative assumptions in reclamation level design shall be avoided as much as practical and the buffer in height of reclamation shall be limited to less than 2m compared to the required level.				
Height of Reclamation Level (in m) higher than Required	Score															
0.5m or less	30%															
Between 0.5m and 2m	Regressive score from 30% to 0% with interpolation within range															
2m or more	0%															
	2. Land reclamation method – perimeter [Imposed Conditions]															
	(A) Foundation of seawall															
	Total length of perimeter of land reclamation (m)															
(1)	# Percentage of length – without seawall structure (P_{fs1}).	<table border="1"> <thead> <tr> <th>Aspects</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{fs1})</td> <td>$(P_{fs1}) \times 18\%$</td> </tr> <tr> <td>(P_{fs2})</td> <td>$(P_{fs2}) \times 18\%$</td> </tr> <tr> <td>(P_{fs3})</td> <td>$(P_{fs3}) \times 14.4\%$</td> </tr> <tr> <td>(P_{fs4})</td> <td>$(P_{fs4}) \times 9\%$</td> </tr> <tr> <td>(P_{fs5})</td> <td>$(P_{fs5}) \times 9\%$</td> </tr> </tbody> </table>	Aspects	Formula	(P_{fs1})	$(P_{fs1}) \times 18\%$	(P_{fs2})	$(P_{fs2}) \times 18\%$	(P_{fs3})	$(P_{fs3}) \times 14.4\%$	(P_{fs4})	$(P_{fs4}) \times 9\%$	(P_{fs5})	$(P_{fs5}) \times 9\%$	18%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (5) should be equal to 100%.
Aspects	Formula															
(P_{fs1})	$(P_{fs1}) \times 18\%$															
(P_{fs2})	$(P_{fs2}) \times 18\%$															
(P_{fs3})	$(P_{fs3}) \times 14.4\%$															
(P_{fs4})	$(P_{fs4}) \times 9\%$															
(P_{fs5})	$(P_{fs5}) \times 9\%$															
(2)	# Percentage of length – seawall founded on seabed (P_{fs2}).		18%													
(3)	# Percentage of length – seawall require dredging works (P_{fs3}).		14.4%													
(4)	# Percentage of length – seawall require deep cement mixing (DCM) (P_{fs4}).		9%													
(5)	# Percentage of length – seawall require stone columns foundation (P_{fs5}).		9%													
	(B) Seawall structures															
(1)	# Percentage of length – without seawall structure (P_{ws1}).	<table border="1"> <thead> <tr> <th>Aspects</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{ws1})</td> <td>$(P_{ws1}) \times 12\%$</td> </tr> <tr> <td>(P_{ws2})</td> <td>$(P_{ws2}) \times 12\%$</td> </tr> <tr> <td>(P_{ws3})</td> <td>$(P_{ws3}) \times 9.6\%$</td> </tr> <tr> <td>(P_{ws4})</td> <td>$(P_{ws4}) \times 8.4\%$</td> </tr> </tbody> </table>	Aspects	Formula	(P_{ws1})	$(P_{ws1}) \times 12\%$	(P_{ws2})	$(P_{ws2}) \times 12\%$	(P_{ws3})	$(P_{ws3}) \times 9.6\%$	(P_{ws4})	$(P_{ws4}) \times 8.4\%$	12%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Prefabrication works and works following standard details/drawing are highly appreciated. Different types of works would contribute different maximum BES(E) Score according to buildability.		
Aspects	Formula															
(P_{ws1})	$(P_{ws1}) \times 12\%$															
(P_{ws2})	$(P_{ws2}) \times 12\%$															
(P_{ws3})	$(P_{ws3}) \times 9.6\%$															
(P_{ws4})	$(P_{ws4}) \times 8.4\%$															
(2)	# Percentage of length – rubble mound seawall (P_{ws2}).		12%													
(3)	# Percentage of length – seawalls with details follow CEDD Standard Drawings (P_{ws3}).		9.6%													
(4)	# Percentage of length – seawalls with details do not follow CEDD Standard Drawings (P_{ws4}).		8.4%													
(5)	# Percentage of length – seawall with precast caissons (P_{ws5}).		7.2%													

Item No.	Assessment Items / Aspects	Scoring Method		Max. Score % Gain	Remarks
	(6) # Percentage of length – seawall with steel caisson - non dredged (P_{ws6}).	(P_{ws5})	$(P_{ws5}) \times 7.2\%$	4.8%	Note #: The sum of percentages assigned for aspects (1) to (6) should be equal to 100%.
		(P_{ws6})	$(P_{ws6}) \times 4.8\%$		
	Imposed Conditions (ICM1): -	ICM1 = 0.5 x (30% - Sum of Score obtained from (2)(A) and (2)(B))			Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions.
3. Land reclamation method - main platform					
Total area of reclamation platform (m ²)					
	(1) # Percentage of area – surcharging with inclusions (P_{irm1}).	Aspect	Formula	40%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (6) should be equal to 100%.
	(2) # Percentage of area – artificial beach, cascades and/or multi-use open area (P_{irm2}).	(P_{irm1})	$(P_{irm1}) \times 40\%$	36%	
	(3) # Percentage of area – adopt spreader pontoon to decrease the induced shear stress (P_{irm3}).	(P_{irm2})	$(P_{irm2}) \times 36\%$	36%	
	(4) # Percentage of area – reclamation involving reduction of slope angle of the fill (P_{irm4}).	(P_{irm3})	$(P_{irm3}) \times 36\%$	32%	
	(5) # Percentage of area – reclamation supported by soil improvement techniques (P_{irm5}).	(P_{irm4})	$(P_{irm4}) \times 32\%$	32%	
	(6) # Percentage of area – reclamation involving removal soft compressible materials mechanically with a hydraulic excavator (P_{irm6}).	(P_{irm5})	$(P_{irm5}) \times 32\%$	28%	
		(P_{irm6})	$(P_{irm6}) \times 28\%$		

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks	
3.M2	Wave Protection Structures :-				
	Wave protection should be efficient in respect of the functional use, cost effectiveness and buildability				
	Total length of wave protection structures				
	Materials used for wave protection structures (including revetment construction, vertical seawall, offshore wave barrier and breakwaters)				
	(1) # Percentage of length of structures constructed by natural materials (P_{wpd1}).	Length of details	Formula	100%	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is. Examples of natural materials are application of natural stone, formation of beach by sand, mud flat of similar works for eco shoreline. Examples of prefabricated units are prefabricated armouring units, seawall blocks, or bio-blocks and other particular prefabricated items for eco-shoreline. Users should provide general layout demonstrating the use of natural materials at natural slopes. Note #: The sum of percentages assigned for aspects (1) to (4) should be equal to 100%.
	(2) # Percentage of length of structures with elements prefabricated off-site (P_{wpd2}).	(P_{wpd1})	$(P_{wpd1}) \times 100\%$	75%	
	(3) # Percentage of length of revetment without rubble toe scour protection (P_{wpd3}).	(P_{wpd2})	$(P_{wpd2}) \times 75\%$	40%	
	(4) # Percentage of length of revetment without extensive cope line embankments (P_{wpd4}).	(P_{wpd3})	$(P_{wpd3}) \times 40\%$	30%	
		(P_{wpd4})	$(P_{wpd4}) \times 30\%$		
3.M3	Pier/ Jetty Structures:-				
	For pile formation, please refer to Module 3.G; For structure above deck, please refer to Module 3.F				
	1. Deck structures				
	Total volume of concrete of deck structure (m ³)				
	Percentage of Volume of concrete that pre-casting method is adopted (P_{pcp}).	(P_{pcp})	Score	100%	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is. More than 40% of the works should be prefabricated.
		40% or less	0%		
		Between 40% and 90%	Progressive score from 0% to 100% with interpolation within range		
		More than and equal to 90%	100%		

Module 3 – Details of Designs –Elevated Structures Works

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks												
3.E1	Elevated Structural Works															
	(A) Structural system															
	1. Types of construction method															
(1)	No. of types of construction method adopted.	<table border="1"> <thead> <tr> <th>No. of types of Construction Method</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1 and 2</td> <td>6% *</td> </tr> <tr> <td>3 or above</td> <td>0%</td> </tr> </tbody> </table>	No. of types of Construction Method	Score	1 and 2	6% *	3 or above	0%	6% *	For standardisation purpose, no. of types of construction method in a project shall be limited to less than three (3) . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.E1(D).						
No. of types of Construction Method	Score															
1 and 2	6% *															
3 or above	0%															
	2. Selection of construction method [Imposed Conditions]															
	Total length of structural system (m)															
(1)	# Percentage of length – full span deck unit placement (P_{bcm1}).	<table border="1"> <thead> <tr> <th>Aspect</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{bcm1})</td> <td>$(P_{bcm1}) \times 14\% *$</td> </tr> <tr> <td>(P_{bcm2})</td> <td>$(P_{bcm2}) \times 9.8\% *$</td> </tr> <tr> <td>$(P_{bcm3})$</td> <td>$(P_{bcm3}) \times 9.8\% *$</td> </tr> <tr> <td>$(P_{bcm4})$</td> <td>$(P_{bcm5}) \times 7\% *$</td> </tr> <tr> <td>$(P_{bcm5})$</td> <td>$(P_{bcm6}) \times 4.2\% *$</td> </tr> </tbody> </table>	Aspect	Formula	(P_{bcm1})	$(P_{bcm1}) \times 14\% *$	(P_{bcm2})	$(P_{bcm2}) \times 9.8\% *$	(P_{bcm3})	$(P_{bcm3}) \times 9.8\% *$	(P_{bcm4})	$(P_{bcm5}) \times 7\% *$	(P_{bcm5})	$(P_{bcm6}) \times 4.2\% *$	14% *	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (5) should be equal to 100%. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.E1(D).
Aspect	Formula															
(P_{bcm1})	$(P_{bcm1}) \times 14\% *$															
(P_{bcm2})	$(P_{bcm2}) \times 9.8\% *$															
(P_{bcm3})	$(P_{bcm3}) \times 9.8\% *$															
(P_{bcm4})	$(P_{bcm5}) \times 7\% *$															
(P_{bcm5})	$(P_{bcm6}) \times 4.2\% *$															
(2)	# Percentage of length – balanced cantilever (P_{bcm2}).		9.8% *													
(3)	# Percentage of length – incremental launching (P_{bcm3}).		9.8% *													
(4)	# Percentage of length – traditional ground based formwork / falsework (P_{bcm4}).		7% *													
(5)	# Percentage of length – suspension, cable-stayed or other cable-supported bridge types (P_{bcm5}).		4.2% *													
	Imposed Conditions (ICE1): -	ICE1 = 0.5 x (14% * - Sum of Score obtained from (1) to (5))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.E1(D).												

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks										
	(B) Structural deck arrangement													
	Deck arrangement should be efficient in respect of the structure system adopted, cost effective and buildability													
	1. Type of structural decks													
	Total number of deck spans		6% *	For standardisation purpose, no. of types of the most common type of decks in a project shall be more than 50% .										
	Percentage of spans of the most common type of decks (P_{dsc}).	<table border="1"> <thead> <tr> <th>(P_{dsc})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>50% or less</td> <td>0%</td> </tr> <tr> <td>Between 50% and 80%</td> <td>Progressive score from 0% to 6% * with interpolation within range</td> </tr> <tr> <td>80% or more</td> <td>6% *</td> </tr> </tbody> </table>	(P_{dsc})	Score	50% or less	0%	Between 50% and 80%	Progressive score from 0% to 6% * with interpolation within range	80% or more	6% *		* The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.E1(D).		
(P_{dsc})	Score													
50% or less	0%													
Between 50% and 80%	Progressive score from 0% to 6% * with interpolation within range													
80% or more	6% *													
	2. Structural deck arrangement [Imposed Conditions]													
	(1) # Percentage of deck spans formed by modular construction (P_{ds1}).	<table border="1"> <thead> <tr> <th>Aspects</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{ds1})</td> <td>$(P_{ds1}) \times 14\% *$</td> </tr> <tr> <td>(P_{ds2})</td> <td>$(P_{ds2}) \times 11.2\% *$</td> </tr> <tr> <td>$(P_{ds3})$</td> <td>$(P_{ds3}) \times 9.8\% *$</td> </tr> <tr> <td>$(P_{ds4})$</td> <td>$(P_{ds4}) \times 5.6\% *$</td> </tr> </tbody> </table>	Aspects	Formula	(P_{ds1})	$(P_{ds1}) \times 14\% *$	(P_{ds2})	$(P_{ds2}) \times 11.2\% *$	(P_{ds3})	$(P_{ds3}) \times 9.8\% *$	(P_{ds4})	$(P_{ds4}) \times 5.6\% *$	14% *	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is.
Aspects	Formula													
(P_{ds1})	$(P_{ds1}) \times 14\% *$													
(P_{ds2})	$(P_{ds2}) \times 11.2\% *$													
(P_{ds3})	$(P_{ds3}) \times 9.8\% *$													
(P_{ds4})	$(P_{ds4}) \times 5.6\% *$													
	(2) # Percentage of deck spans formed by steel frame / truss (P_{ds2}).		11.2% *	Different types of works would contribute different maximum BES(E) Score according to buildability.										
	(3) # Percentage of deck spans formed by precast / prefabricated deck units (P_{ds3}).		9.8% *	Note #: The sum of percentages assigned for aspects (1) to (4) should be equal to 100%.										
	(4) # Percentage of deck spans formed by cast in-situ deck segments (P_{ds4}).		5.6% *	* The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.E1(D).										
	Imposed Conditions (ICE2): -	ICE2 = 0.5 x (14% * - Sum of Score obtained from (1) to (4))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the "Remarks" column to address such imposed conditions. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.E1(D).										

Item No.	Assessment Items / Aspects	Scoring Method		Max. Score % Gain	Remarks
	(C) Structural deck form				
	1. Formation of structural deck				
	Total length of structural deck (m)				
	(1) # Percentage of length of structural deck – simple full deck width bridge segment (P_{fsd1}).	Percentage length of deck formation	Formula	4% *	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. Different types of works would contribute different maximum BES(E) Score according to buildability. Note #: The sum of percentages assigned for aspects (1) to (4) should be equal to 100%. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.E1(D).
	(2) # Percentage of length of structural deck – closely spaced deck beams (P_{fsd2}).	(P_{fsd1})	$(P_{fsd1}) \times 4\% *$	3.8% *	
	(3) # Percentage of length of structural deck – widely spaced deck beams with slab (P_{fsd3}).	(P_{fsd2})	$(P_{fsd2}) \times 3.8\% *$	2.8% *	
	(4) # Percentage of length of structural deck – other bridge formation with multiple trade of works (P_{fsd4}).	(P_{fsd3})	$(P_{fsd3}) \times 2.8\% *$	2% *	
		(P_{fsd4})	$(P_{fsd4}) \times 2\% *$		
	2. Minimize intermediate diaphragm between beams				
	Total number of structural beams/deck beams				
	(1) Percentage of deck beams not requiring intermediate diaphragm (P_{dbi}).	(P_{dbi})	Score	8% *	* The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.E1(D).
		80% or more	0%		
		Between 80% and 60%	Regressive score from 0% to 8% * with interpolation within range		
		60% or more	8% *		
	3. Minimize curved beams				
	(1) Percentage of non-curved beams (P_{dbc}).	(P_{dbc})	Score	8% *	* The maximum % gain would be adjusted if N/A cases are identified in aspects in Item 3.E1(D).
		50% or more	0%		
		Between 50% and 30%	Regressive score from 0% to 8% * with interpolation within range		
		30% or more	8% *		

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
	(D) Piers											
	1. Type of piers											
	Total number of piers [Note 2]											
(1)	Percentage – no. of the most common type piers to total no. of piers (P_{spc}).	<table border="1"> <thead> <tr> <th>(P_{spc})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>50% or less</td> <td>0%</td> </tr> <tr> <td>Between 50% and 80%</td> <td>Progressive score from 0% to 6% * with interpolation within range</td> </tr> <tr> <td>80% or more</td> <td>6% *</td> </tr> </tbody> </table>	(P_{spc})	Score	50% or less	0%	Between 50% and 80%	Progressive score from 0% to 6% * with interpolation within range	80% or more	6% *	6% *	<p>For standardisation purpose, no. of types of the most common type of columns/piers in a project shall be more than 50%.</p> <p>* The maximum % gain of other items would be adjusted if N/A cases are identified in this item. The maximum % gain of this item will be zero.</p>
(P_{spc})	Score											
50% or less	0%											
Between 50% and 80%	Progressive score from 0% to 6% * with interpolation within range											
80% or more	6% *											
	2. Prefabrication of piers											
(1)	# Percentage – no. of prefabricated piers to total no. of piers (P_{sp1}).	<table border="1"> <thead> <tr> <th>Aspects</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{sp1})</td> <td>$(P_{sp1}) \times 10\% *$</td> </tr> <tr> <td>(P_{sp2})</td> <td>$(P_{sp2}) \times 7\% *$</td> </tr> <tr> <td>(P_{sp3})</td> <td>$(P_{sp3}) \times 4\% *$</td> </tr> </tbody> </table>	Aspects	Formula	(P_{sp1})	$(P_{sp1}) \times 10\% *$	(P_{sp2})	$(P_{sp2}) \times 7\% *$	(P_{sp3})	$(P_{sp3}) \times 4\% *$	10% *	<p>For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is.</p> <p>Different types of works would contribute different maximum BES(E) Score according to buildability.</p> <p>Note #: The sum of percentages assigned for aspects (1) to (3) should be equal to 100%.</p> <p>* The maximum % gain of other items would be adjusted if N/A cases are identified in this item. The maximum % gain of this item will be zero.</p>
Aspects	Formula											
(P_{sp1})	$(P_{sp1}) \times 10\% *$											
(P_{sp2})	$(P_{sp2}) \times 7\% *$											
(P_{sp3})	$(P_{sp3}) \times 4\% *$											
(2)	# Percentage – no. of piers adopting pre-cast shells to total no. of piers (P_{sp2}).		7% *									
(3)	# Percentage – no. of cast in-situ piers to total no. of piers (P_{sp3}).		4% *									
	3. Minimize in-situ cross head											
(1)	Percentage – no. of piers <u>not</u> requiring in-situ cross head to total no. of piers (P_{sph}).	<table border="1"> <thead> <tr> <th>(P_{sph})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>75% or less</td> <td>0%</td> </tr> <tr> <td>Between 75% and 90%</td> <td>Progressive score from 0% to 4% * with interpolation within range</td> </tr> <tr> <td>90% or more</td> <td>4% *</td> </tr> </tbody> </table>	(P_{sph})	Score	75% or less	0%	Between 75% and 90%	Progressive score from 0% to 4% * with interpolation within range	90% or more	4% *	4% *	<p>For simplification purpose, simpler and easier the proposed works, higher the buildability the project is. No. of structural columns / piers shall be minimised.</p> <p>* The maximum % gain of other items would be adjusted if N/A cases are identified in this item. The maximum % gain of this item will be zero.</p>
(P_{sph})	Score											
75% or less	0%											
Between 75% and 90%	Progressive score from 0% to 4% * with interpolation within range											
90% or more	4% *											
	(E) Reinforced concrete detailing											
(1)	Degree of satisfaction of reinforcement detailing to facilitate rebar fixing.	<p>For (1) and (2), % Gained = % input x 8% *</p> <p>For (3), % Gained = % input x 4% *</p>	8% *	<p>Reinforcement details shall take into account to facilitate the construction works on site, including delivery, handling, and installation. Project Engineer shall assess five (5) most critical locations and average the result based on their experience.</p> <p>Project Engineer could assess the degree of compliance and provide the appropriate BES(E) Score in each aspect.</p> <p>For composite structures, Users should consider the majority of structural materials (either steelworks or reinforced concrete) by means of volume.</p>								
(2)	Degree of satisfaction of reinforcement detailing to facilitate concreting.		8%*									
(3)	Degree of satisfaction of reinforcement detailing of similar size, span and loading.		4% *									

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
				* The maximum % gain would be re-distributed if N/A cases are identified in aspects in Item 3.E1(D).								
(F) Structural steelworks detailing												
(1)	Degree of compliance for detailing taking into account of prefabrication, delivery and erection.	For (1), % Gained = % input x 4%*	4% *	Structural steelworks details shall take into account to facilitate the construction works on site, including delivery, handling, and installation. Project Engineer shall assess five (5) most critical locations and average the result based on their experience. Project Engineer could assess the degree of compliance and provide the appropriate BES(E) Score in each aspect. For composite structures, Users should consider the majority of structural materials (either steelworks or reinforced concrete) by means of volume. * The maximum % gain would be re-distributed if N/A cases are identified in aspects in Item 3.E1(D).								
(2)	Degree of compliance for minimizing temporary works on site.	For (2) and (3), % Gained = % input x 3% *	3% *									
(3)	Degree of compliance for minimizing on-site welding by efficient bolted connection system.		3% *									
(4)	Degree of compliance for detailing taking into account of locations and constraints of on-site connection.	For (4) to (8), % Gained = % input x 2% *	2% *									
(5)	Degree of compliance for eliminating built-up sections.		2% *									
(6)	Degree of compliance for specifying steel sections commonly available in the market.		2% *									
(7)	Degree of compliance for incorporating interface requirements from other disciplines.		2% *									
(8)	Degree of compliance for avoiding connections at critical / complex sections.	2% *										
3.E2 Parapets and Median Barriers:-												
1. Type of parapets and median barriers (excluding end panels)												
(1)	No. of type of parapets and median barriers.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9d9d9;">No. of types of parapet and median barriers</th> <th style="background-color: #d9d9d9;">Score</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1 to 3</td> <td style="text-align: center;">20%</td> </tr> <tr> <td style="text-align: center;">Between 3 and 7</td> <td style="text-align: center;">Regressive score from 20% to 0% with interpolation within range</td> </tr> <tr> <td style="text-align: center;">7 or more</td> <td style="text-align: center;">0%</td> </tr> </tbody> </table>	No. of types of parapet and median barriers	Score	1 to 3	20%	Between 3 and 7	Regressive score from 20% to 0% with interpolation within range	7 or more	0%	20%	For standardisation purpose, no. of types of parapets and median barriers in a project shall be limited to less than seven (7) .
No. of types of parapet and median barriers	Score											
1 to 3	20%											
Between 3 and 7	Regressive score from 20% to 0% with interpolation within range											
7 or more	0%											

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks										
2. Standardization of parapets and median barriers (excluding end panels)														
Total length of parapets and median barriers (m)														
(1)	Percentage of length of parapets and median barriers following HyD standard details (P_{pas}).	<table border="1"> <thead> <tr> <th>P_{pas}</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>Less than 70%</td> <td>0%</td> </tr> <tr> <td>Between 70% and 90%</td> <td>Regressive score from 0% to 30% with interpolation within range</td> </tr> <tr> <td>90% or more</td> <td>30%</td> </tr> </tbody> </table>	P_{pas}	Score	Less than 70%	0%	Between 70% and 90%	Regressive score from 0% to 30% with interpolation within range	90% or more	30%	30%	For standardization purpose, higher extent of works following standard details/drawings, higher the buildability the project is.		
P_{pas}	Score													
Less than 70%	0%													
Between 70% and 90%	Regressive score from 0% to 30% with interpolation within range													
90% or more	30%													
3. Prefabrication of parapets and median barriers														
(1)	# Percentage of length – pre-cast parapets and median barriers (P_{pa1}).	<table border="1"> <thead> <tr> <th>Aspects</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{pa1})</td> <td>$(P_{pa1}) \times 50\%$</td> </tr> <tr> <td>(P_{pa2})</td> <td>$(P_{pa2}) \times 35\%$</td> </tr> <tr> <td>(P_{pa3})</td> <td>$(P_{pa3}) \times 20\%$</td> </tr> </tbody> </table>	Aspects	Formula	(P_{pa1})	$(P_{pa1}) \times 50\%$	(P_{pa2})	$(P_{pa2}) \times 35\%$	(P_{pa3})	$(P_{pa3}) \times 20\%$	50%	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is.		
Aspects	Formula													
(P_{pa1})	$(P_{pa1}) \times 50\%$													
(P_{pa2})	$(P_{pa2}) \times 35\%$													
(P_{pa3})	$(P_{pa3}) \times 20\%$													
(2)	# Percentage of length – parapets and median barriers adopting pre-cast shells (P_{pa2}).		35%	Different types of works would contribute different maximum BES(E) Score according to buildability.										
(3)	# Percentage of length – cast in-situ parapets and median barriers (P_{pa3}).		20%	Note #: The sum of percentages assigned for aspects (1) to (3) should be equal to 100%.										
3.E3	Finishes / External Finishes (For Pedestrian Walkway Only):-													
1. Type of façade / external finishes														
(1)	No. of type of façade / external finishes involved.	<table border="1"> <thead> <tr> <th>No. of types of façade / external finishes</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1 to 3</td> <td>20%</td> </tr> <tr> <td>4 or more</td> <td>0%</td> </tr> </tbody> </table>	No. of types of façade / external finishes	Score	1 to 3	20%	4 or more	0%	20%	For standardisation purpose, no. of types of channel bed linings in a project shall be limited to less than four (4) . For structures with multiple finishing layers (e.g. painting works on F4 finishes), only the outmost finishes should be considered. For façade or similar type of external finishes, end panel could be neglected.				
No. of types of façade / external finishes	Score													
1 to 3	20%													
4 or more	0%													
2. Selection of façade / external finishes														
Total area of external surface regarding façade / external finishes (m ²)		<table border="1"> <thead> <tr> <th>Aspects</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>(P_{bef1})</td> <td>$(P_{bef1}) \times 30\%$</td> </tr> <tr> <td>(P_{bef2})</td> <td>$(P_{bef2}) \times 27\%$</td> </tr> <tr> <td>(P_{bef3})</td> <td>$(P_{bef3}) \times 15\%$</td> </tr> <tr> <td>(P_{bef4})</td> <td>$(P_{bef4}) \times 15\%$</td> </tr> </tbody> </table>	Aspects	Formula	(P_{bef1})	$(P_{bef1}) \times 30\%$	(P_{bef2})	$(P_{bef2}) \times 27\%$	(P_{bef3})	$(P_{bef3}) \times 15\%$	(P_{bef4})	$(P_{bef4}) \times 15\%$		
Aspects	Formula													
(P_{bef1})	$(P_{bef1}) \times 30\%$													
(P_{bef2})	$(P_{bef2}) \times 27\%$													
(P_{bef3})	$(P_{bef3}) \times 15\%$													
(P_{bef4})	$(P_{bef4}) \times 15\%$													
(1)	# Percentage of external surface area requiring typical F4/F5 finishes according to General Specifications (P_{bef1}).		30%	For simplification purpose, simpler and easier the proposed works, higher the buildability the project is.										
(2)	# Percentage of external surface area requiring external cladding, skylights, façade, etc. which require offsite fabrication (P_{bef2}).		27%	For structures with multiple finishing layers (e.g. painting works on F4 finishes), only the outmost finishes should be considered.										
(3)	# Percentage of external surface area requiring in-situ tailored made finishes (e.g., F6 finishes) (P_{bef3}).		15%	Different types of works would contribute different maximum BES(E) Score according to buildability.										

Item No.	Assessment Items / Aspects	Scoring Method		Max. Score % Gain	Remarks
	(4) # Percentage of external surface area requiring external finishes other than (1) to (3). (P_{bet4}).			15%	Note #: The sum of percentages assigned for aspects (1) to (4) should be equal to 100%.
3. Prefabrication					
	(1) Percentage of external cladding/façade integrated in the precast unit, in terms of cost.	No. of types of parapet and median barriers	Score	50%	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is.
		25% or less	0%		
		Between 25% to 85%	Progressive score from 0% to 50% with interpolation within range		
		85% or more	50%		

Module 3 – Details of Design – Facility Structures

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
3.F1	Facilities Structures Works:-											
	1. Structural grid, columns and floor height											
	(1) Uniform / Minimize storey height types											
	Total number of floors [Note 2]											
	Floor Height: Ratio between no. of types to number of floor (R_{fth}).	<table border="1"> <thead> <tr> <th>(R_{fth})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>20% or less</td> <td>5% *</td> </tr> <tr> <td>Between 20% and 70%</td> <td>Regressive score from 5% * to 0% with interpolation within range</td> </tr> <tr> <td>70% or more</td> <td>0%</td> </tr> </tbody> </table>	(R_{fth})	Score	20% or less	5% *	Between 20% and 70%	Regressive score from 5% * to 0% with interpolation within range	70% or more	0%	5% *	For standardisation purpose, no. of floor height types in a project shall be limited to less than 70% . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.
(R_{fth})	Score											
20% or less	5% *											
Between 20% and 70%	Regressive score from 5% * to 0% with interpolation within range											
70% or more	0%											
	(2a) Uniform / Minimize structural grid types - along x direction											
	Total number of column grid along x direction [Note 2]											
	Column Grid (x direction): Ratio between no. of types to number of column grids (P_{tfgx}).	<table border="1"> <thead> <tr> <th>(P_{tfgx})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>20% or less</td> <td>5% *</td> </tr> <tr> <td>Between 20% and 70%</td> <td>Regressive score from 5% * to 0% with interpolation within range</td> </tr> <tr> <td>70% or more</td> <td>0%</td> </tr> </tbody> </table>	(P_{tfgx})	Score	20% or less	5% *	Between 20% and 70%	Regressive score from 5% * to 0% with interpolation within range	70% or more	0%	5% *	For standardisation purpose, no. of column grid types in a project shall be limited to less than 70% . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.
(P_{tfgx})	Score											
20% or less	5% *											
Between 20% and 70%	Regressive score from 5% * to 0% with interpolation within range											
70% or more	0%											
	(2b) Uniform / Minimize structural grid types - along y direction											
	Total number of column grid along y direction [Note 2]											
	Column Grid (y direction): Ratio between no. of types to number of column grids (P_{tfgy}).	<table border="1"> <thead> <tr> <th>(P_{tfgy})</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>20% or less</td> <td>5% *</td> </tr> <tr> <td>Between 20% and 70%</td> <td>Regressive score from 5% * to 0% with interpolation within range</td> </tr> <tr> <td>70% or more</td> <td>0%</td> </tr> </tbody> </table>	(P_{tfgy})	Score	20% or less	5% *	Between 20% and 70%	Regressive score from 5% * to 0% with interpolation within range	70% or more	0%	5% *	For standardisation purpose, no. of column grid types in a project shall be limited to less than 70% . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.
(P_{tfgy})	Score											
20% or less	5% *											
Between 20% and 70%	Regressive score from 5% * to 0% with interpolation within range											
70% or more	0%											

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
(3) Uniform / Minimize column types												
Total number of columns proposed [Note 2]												
	Column Size: Ratio between no. of types to number of columns (P_{tfc}).	<table border="1"> <thead> <tr> <th style="background-color: #e67e22; color: white;">(P_{tfc})</th> <th style="background-color: #e67e22; color: white;">Score</th> </tr> </thead> <tbody> <tr> <td>15% or less</td> <td>5% *</td> </tr> <tr> <td>Between 15% and 70%</td> <td>Regressive score from 5% * to 0% with interpolation within range</td> </tr> <tr> <td>70% or more</td> <td>0%</td> </tr> </tbody> </table>	(P_{tfc})	Score	15% or less	5% *	Between 15% and 70%	Regressive score from 5% * to 0% with interpolation within range	70% or more	0%	5% *	For standardisation purpose, no. of column size types in a project shall be limited to less than 70% . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.
(P_{tfc})	Score											
15% or less	5% *											
Between 15% and 70%	Regressive score from 5% * to 0% with interpolation within range											
70% or more	0%											
2. Structural floor beams and slabs												
(1) Uniform / Minimize beam size types												
Total number of beam [Note 2]												
	Beam Sectional Size: Ratio between no. of types to number of beam (P_{tfb}).	<table border="1"> <thead> <tr> <th style="background-color: #e67e22; color: white;">(P_{tfb})</th> <th style="background-color: #e67e22; color: white;">Score</th> </tr> </thead> <tbody> <tr> <td>15% or less</td> <td>7.5% *</td> </tr> <tr> <td>Between 15% and 70%</td> <td>Regressive score from 7.5% * to 0% with interpolation within range</td> </tr> <tr> <td>70% or more</td> <td>0%</td> </tr> </tbody> </table>	(P_{tfb})	Score	15% or less	7.5% *	Between 15% and 70%	Regressive score from 7.5% * to 0% with interpolation within range	70% or more	0%	7.5% *	For standardisation purpose, no. of types of size/shape of beam in a project shall be limited to less than 70% . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.
(P_{tfb})	Score											
15% or less	7.5% *											
Between 15% and 70%	Regressive score from 7.5% * to 0% with interpolation within range											
70% or more	0%											
(2) Uniform / Minimize slab thicknesses types												
Total number of structural slabs [Note 2]												
	Structural slab thickness: Ratio between no. of type to number of slab (P_{tfs}).	<table border="1"> <thead> <tr> <th style="background-color: #e67e22; color: white;">(P_{tfs})</th> <th style="background-color: #e67e22; color: white;">Score</th> </tr> </thead> <tbody> <tr> <td>15% or less</td> <td>7.5% *</td> </tr> <tr> <td>Between 15% and 70%</td> <td>Regressive score from 7.5% * to 0% with interpolation within range</td> </tr> <tr> <td>70% or more</td> <td>0%</td> </tr> </tbody> </table>	(P_{tfs})	Score	15% or less	7.5% *	Between 15% and 70%	Regressive score from 7.5% * to 0% with interpolation within range	70% or more	0%	7.5% *	For standardisation purpose, no. of thickness type of structural slab in a project shall be limited to less than 70% . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.
(P_{tfs})	Score											
15% or less	7.5% *											
Between 15% and 70%	Regressive score from 7.5% * to 0% with interpolation within range											
70% or more	0%											

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
3. Structural framing system [Imposed Conditions]												
Prefabrication: -												
	(1) Percentage of volume of concrete for structural slabs / beams using prefabrication. (P_p)	<table border="1"> <thead> <tr> <th>(P_p)</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>70% or more</td> <td>10% *</td> </tr> <tr> <td>Between 70% and 30%</td> <td>Regressive score from 10% * to 0% with interpolation within range</td> </tr> <tr> <td>30% or less</td> <td>0%</td> </tr> </tbody> </table>	(P_p)	Score	70% or more	10% *	Between 70% and 30%	Regressive score from 10% * to 0% with interpolation within range	30% or less	0%	10% *	For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is. * The maximum % gain would be re-distributed if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.
(P_p)	Score											
70% or more	10% *											
Between 70% and 30%	Regressive score from 10% * to 0% with interpolation within range											
30% or less	0%											
	Imposed Conditions (ICF1): -	ICF1 = 0.5 x (10% * - Score obtained from (1))		Users are required to provide the details types of imposed conditions encountered and the corresponding justifications, and to elaborate the application of proposed engineering options in the "Remarks" column to address such imposed conditions. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.								
4. Space for BS / E&M installations												
Effective room arrangement for BS / E&M installations (Input 1 if Yes, 0 if No): -												
	Checked Electrical Source Point and Drainage Discharge Point	For (1) to (4), Yes = 2.5%; * No = 0.0%	2.5% *	Accessible space shall be provided for BS/E&M installations. (Input: Yes = 1; No = 0) * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.								
	Transformer Room / Machine Room located on Ground Floor		2.5% *									
	Adopted MEP Design to be coordinated with Building Plan		2.5% *									
	Facility Structure complies with local Fire Code & Regulations		2.5% *									
5. Façade / External finishes												
(1) Type of façade / external finishes												
	No. of type of façade / external finishes involved.	<table border="1"> <thead> <tr> <th>No. of types of façade / external finishes</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>3% *</td> </tr> <tr> <td>2</td> <td>1.5% *</td> </tr> <tr> <td>3 or more</td> <td>0%</td> </tr> </tbody> </table>	No. of types of façade / external finishes	Score	1	3% *	2	1.5% *	3 or more	0%	3% *	For standardisation purpose, no. of types of Façade/External Finishes in a project shall be limited to less than three (3) . * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.
No. of types of façade / external finishes	Score											
1	3% *											
2	1.5% *											
3 or more	0%											

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks
	(2) Selection of façade / external finishes			
	Total area of external surface requiring façade / external finishes			
	(1) # Percentage of area – typical F4/F5 finishes according to General Specifications (P_{fef1}).	Aspects	Formula	6% *
	(2) # Percentage of area – external cladding, skylights, façade, etc. which require offsite fabrication (P_{fef2}).	(P_{fef1})	$(P_{fef1}) \times 6\% *$	5.4% *
	(3) # Percentage of area – greening feature panels (except climber) (P_{fef3}).	(P_{fef2})	$(P_{fef2}) \times 5.4\% *$	5.1% *
	(4) # Percentage of area – in-situ tailored made finishes (e.g. F6 finishes) (P_{fef4}).	(P_{fef3})	$(P_{fef3}) \times 5.1\% *$	3% *
	(5) # Percentage of area – other external finishes (P_{fef5}).	(P_{fef4})	$(P_{fef4}) \times 3\% *$	3% *
		(P_{fef5})	$(P_{fef5}) \times 3\% *$	
	<p>Note #: The sum of percentages assigned for aspects (1) to (5) should be equal to 100%.</p> <p>* The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.</p>			
	(3) Prefabrication			
	Percentage of cost - prefabricated external cladding / façade.	(P_c)	Score	3% *
	Percentage of cost - prefabricated skylight.	85% or more	3% *	1.5% *
	Percentage of cost prefabricated greening features.	Between 85% and 70%	Regressive score from 3% * to 0% with interpolation within range	1.5% *
		70% or less	0%	
		For Items (2) & (3)		
		(P_c)	Score	
		85% or more	1.5% *	
		Between 85% and 70%	Regressive score from 1.5% * to 0% with interpolation within range	
		70% or less	1.5%	
	<p>* The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.</p>			

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks								
6. Modular integrated construction (MIC) and prefabrication elements												
MIC and prefabrication elements should be adopted to reduce construction time, cost and improve quality												
(1)	Percentage of volume - prefabricated elements used for the roof system	<table border="1"> <thead> <tr> <th>(P_v)</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>85% or more</td> <td>5% *</td> </tr> <tr> <td>Between 85% and 20%</td> <td>Regressive score from 5% * to 0% with interpolation within range</td> </tr> <tr> <td>20% or less</td> <td>0%</td> </tr> </tbody> </table>	(P _v)	Score	85% or more	5% *	Between 85% and 20%	Regressive score from 5% * to 0% with interpolation within range	20% or less	0%	5% *	<p>For standardization purpose, higher extent of works adopting prefabrication, higher the buildability the project is.</p> <p>If MIC is adopted, quantities of structural elements should be counted in corresponding aspect (1) to (4) accordingly.</p> <p>* The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.</p>
(P _v)	Score											
85% or more	5% *											
Between 85% and 20%	Regressive score from 5% * to 0% with interpolation within range											
20% or less	0%											
(2)	Percentage of volume - prefabricated column and wall.	5% *										
(3)	Percentage of volume - prefabricated slab and stair.	5% *										
(4)	Percentage of volume - prefabricated beam.	5% *										
7. Reinforced concrete detailing												
(1)	Degree of satisfaction of reinforcement detailing to facilitate rebar fixing.	<p>For (1) and (2), % Gained = % input x 4% *</p> <p>For (3), % Gained = % input x 2% *</p>	4% *	<p>Reinforcement details shall take into account to facilitate the construction works on site, including delivery, handling, and installation. Project Engineer shall assess five (5) most critical locations and average the result based on their experience.</p> <p>Project Engineer could assess the degree of compliance and provide the appropriate BES(E) Score in each aspect.</p> <p>For composite structures, Users should consider the majority of structural materials (either steelworks or reinforced concrete) by means of volume.</p> <p>* The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.</p>								
(2)	Degree of satisfaction of reinforcement detailing to facilitate concreting.		4% *									
(3)	Degree of standardization of reinforcement detailing of similar size, span and loading.		2% *									
8. Structural steelworks detailing												
(1)	Degree of compliance for detailing taking into account of prefabrication, delivery and erection.	<p>For (1) % Gained = % input x 2% *</p> <p>For (2) and (3) % Gained = % input x 1.5% *</p>	2% *	<p>Structural steelworks details shall take into account to facilitate the construction works on site, including delivery, handling, and installation. Project Engineer shall assess five (5) most critical locations and average the result based on their experience.</p> <p>Project Engineer could assess the degree of compliance and provide the appropriate BES(E) Score in each aspect.</p>								
(2)	Degree of compliance for minimizing temporary works on site.		1.5% *									
(3)	Degree of compliance for minimizing on-site welding by efficient bolted connection system.		1.5% *									

Item No.	Assessment Items / Aspects	Scoring Method	Max. Score % Gain	Remarks
(4)	Degree of compliance for detailing taking into account of locations and constraints of on-site connection.	For (4) to (8), % Gained = % input x 1% *	1% *	For composite structures, Users should consider the majority of structural materials (either steelworks or reinforced concrete) by means of volume. * The maximum % gain would be adjusted if N/A cases are identified in aspects in Items within 3.F1 and 3.F2.
(5)	Degree of compliance for eliminating built-up sections.		1% *	
(6)	Degree of compliance for specifying steel sections commonly available in the market.		1% *	
(7)	Degree of compliance for incorporating interface requirements from other disciplines.		1% *	
(8)	Degree of compliance for avoiding connections at critical / complex sections.		1% *	

Module 4 – Maintenance Requirements

Item No.	Assessment Items / Aspects	Scoring Method	BES(E) Score Gain [Note 1]	Remarks
4.1	Maintenance Accessibility and Facilities (Max. 30 BES(E) Score)			
	Provide effective maintenance accessibility and facilities – 5 aspects under Sub-items (A) and (B) below:-			
	Sub-item (A) Provide effective maintenance on accessibility – 2 aspects: -			
(1)	With adequate width, sizes, headroom & loading capacity, and maneuverable space.	Yes / No / N/A	7.5	Key considerations are shown in Appendix D of this Manual.
(2)	With a lower maintenance requirements and more effective recurrent cost.	Yes / No / N/A	7.5	
	Sub-item (B) Provide effective maintenance on facilities – 3 aspects: -			
(1)	Adequate isolating route or backup equipment.	Yes / No / N/A	4.5	Key considerations are shown in Appendix D of this Manual.
(2)	Sufficient cleaning / draining / air ventilation system.	Yes / No / N/A	4.5	
(3)	Safety provisions for working in high risk locations.	Yes / No / N/A	6	
4.2	Space Planning for Maintenance and Future Operation Requirements (Max 20 BES(E) Score)			
	Provide suitable space planning for maintenance – 2 aspects: -			
(1)	Flexibility to alter the layout for future conversion, alteration and/or other improvement works.	Yes / No / N/A	12	Key considerations are shown in Appendix D of this Manual.
(2)	Co-location and confinement of utilities.	Yes / No / N/A	8	
4.3	Durability of Systems / Components / Materials (Max 20 BES(E) Score)			
	Improve durability of systems / components / materials – 3 aspects: -			
(1)	Standardization of systems / components / materials.	Yes / No / N/A	8	Key considerations are shown in Appendix D of this Manual.
(2)	Ease of maintenance of the systems and replacement of components / materials.	Yes / No / N/A	6	
(3)	Components and materials should have good performance against wear and tear, weathering, discoloration, deformation and degradation.	Yes / No / N/A	6	
4.4	Futureproofing of Components / Materials (Max 15 BES(E) Score)			
	Allow for provisions for future replacement and upgrading of components and materials – 2 aspects: -			
(1)	High quality components / materials with low maintenance requirements.	Yes / No / N/A	7.5	Key considerations are shown in Appendix D of this Manual.
(2)	Components / materials are readily available in the market.	Yes / No / N/A	7.5	

Item No.	Assessment Items / Aspects	Scoring Method	BES(E) Score Gain [Note 1]	Remarks
4.5	Asset Management System for Ease of Future Maintenance (Max 15 BES(E) Score)			
	Provide suitable applications for ease of future maintenance – 4 aspects: -			
	(1) Adoption of QR codes, or other similar hardware for facility management.	Yes / No / N/A	3.75	Key considerations are shown in Appendix D of this Manual.
	(2) Application of IT technology in for facility management.	Yes / No / N/A	3.75	
	(3) Adoption of RFID technology or other similar system for facility management.	Yes / No / N/A	3.75	
	(4) Enabling real-time monitoring system for facility management	Yes / No / N/A	3.75	

Module 5 – Innovation and Creativity (Max. 200 Bonus Score)

Item No.	Attribute	Scoring Method	BES(E) Score	Remarks
Four specific considerations of concern include				
	(A) Reducing Life-cycle Cost.	Direct input of BES(E) Score after assessment	40	BES(E) Score can be obtained for any promotion and adoption of innovation with a view to enhancing the design and construction and boosting up the buildability of the projects under Attributes (A) to (E) in this module.
	(B) Reducing construction period.	Direct input of BES(E) Score after assessment	40	For Attributes (A) to (D), the maximum BES(E) Score 40. Achievement of innovation and creativity shall be in 20 or 40 BES(E) score if the following criteria can be achieved: (i) (Good) – The innovative item can generally provide good performance and genuinely improve the buildability of the contract: 20 BES(E) Score. (ii) (Excellent) – The innovative item plays a critical role in the contract and can considerably enhance the buildability of the contract: 40 BES(E) Score.
	(C) Reducing Labour Intensity.	Direct input of BES(E) Score after assessment	40	
	(D) Reducing Reliance on Skilled Labour.	Direct input of BES(E) Score after assessment	40	For Attribute (E), the maximum BES(E) Score 40. Achievement of innovation and creativity shall be in 20 or 40 BES(E) score if the following criteria can be achieved: (i) (Good) – The innovative item can generally provide good performance and genuinely enhance construction safety: 20 BES(E) Score. (ii) (Excellent) – The innovative item plays a critical role in the contract and can considerably enhance construction safety: 40 BES(E) Score.
	(E) Enhancing Construction safety	Direct input of BES(E) Score after assessment	40	For further details, please refer to Appendix G of the User Manual.

Notes:

1. User can select “N/A” for BES(E) assessment in Modules 1, 2 and 4 if the corresponding assessment aspects are not applicable. The BES(E) Score of that particular aspects would be re-distributed to remaining assessment aspects within the same items.

[Imposed Conditions]:

The buildability may be affected by some imposed conditions (e.g. site constraints, operational requirements and some particular situation). When imposed condition is encountered and governing the suitable engineering options as specified in the BES(E) Tool, BES(E) Score could be awarded if reasonable design effort had been made. In the assessment, Users are required to provide the details of imposed conditions encountered and the corresponding justification, and to elaborate the application of proposed engineering options in the “Remarks” column to address such imposed conditions. A compensatory BES(E) Score, with the following equation, would be restored:

$$\text{Compensatory BES(E) Score} = 50\% \text{ of BES(E) Score lost in that items / aspects}$$

2. In Modules 3, Users can provide “0” in quantity if the corresponding assessment aspects are not applicable (i.e. N/A cases). The BES(E) Score of this aspect would be re-distributed to remaining assessment aspects within the same items / works category.

APPENDIX B

Terms and Definitions

<u>Terms</u>	<u>Definition</u>
Compatible Layout	Layout that is produced in Building Information Modelling (BIM) environment in accordance with DEVB TC(W) No. 2/2021 or other similar methods and shows that there are no conflicts in all disciplines.
Complex Geology	Ground conditions involving <i>Scheduled Area Nos. 1, 2 and 4, Northshore Lantau</i> , fault/shear zone, folding, marble bearing stratum, karst, cavity, extensive low shear strength weak seams, etc.
Design Consideration for Land Reclamation	Tidal level, storm surge, climate change, longer term settlement and other site-specific considerations.
Facility Structures	<p>All structures including but not limited to the following: -</p> <ul style="list-style-type: none"> • ventilation shafts; • sewage pumping stations; • drainage pumping station; • flood storage facilities; • sewage treatment works; • effluent polishing plant; • stormwater storage tank; • reservoir; • piers. <p>except: -</p> <ol style="list-style-type: none"> i. Bridge, elevated structures and landscape deck (to be assessed under Module 3.E – Elevated Structure Works). ii. Service reservoirs (to be assessed under Module 3.W – Waterworks).
High Risk Locations	Work area in confined spaces, near water, at height, in vicinity of public utilities, adjacent to traffic, etc.
Joints in Roadworks	<p>Joints in roadworks including but not limited to the following: -</p> <ul style="list-style-type: none"> • Expansion joints; • Contraction joints; • Longitudinal joints; or • Construction joints.
Key Event	Major activity lies on critical path which will result in programme delay if it is not completed on schedule.
Maintenance Access and Other Provisions	Illumination, power socket, cat ladders, safety anchors, lifting/hoisting devices, working platforms and other necessary equipment for maintenance purpose.

<u>Terms</u>	<u>Definition</u>
Minimized Coral Relocation/Ecological Translocation	Coral relocation/ecological translocation is limited to the footprint of the permanent works (which includes for temporary works, say 15m).
Minimized Tree Removal / Transplantation	Tree removal/transplantation is limited to the footprint of the permanent works (which includes for temporary works, say 5m).
Natural Features as Noise Mitigation Works	Natural features including but not limited to the following: - <ul style="list-style-type: none"> • Earth mounding; or • Planting.
Noise Barrier Panels	Noise barrier panels including but not limited to the following: - <ul style="list-style-type: none"> • Reflective panels; or • Absorptive panels.
Project Zone(s)	Allows Users to split the project into different Project Zones according to relative levels of complexity and/or constraints for the purposes of this assessment tool.
Road Furniture	Road Furniture including but not limited to the following: - <ul style="list-style-type: none"> • Joints in roadworks; • Profile barriers; • Beam barriers; • Railings and bollards; • ATC and E&M facilities; • Dwarf wall, planter wall and other landscaping works; • Signposts; • Sign Gantry; • Road kerbs; or • Fire hydrants.
Site Layout	General layout within the Site.
Site Position	Overall position of the Site located.
Suitable Time for Fill Placement in Reclamation	Only after consolidation has achieved target strength gain.
Surface Protection/Erosion Control for Slope	Hydroseeding, shotcreting or other techniques as recommended in GEO Publication No. 1/2009 and/or other relevant references.

<u>Terms</u>	<u>Definition</u>
Type of BS/E&M equipment	BS/E&M equipment including but not limited to the following: - <ul style="list-style-type: none"> • Lift; • Chiller; • Cooling tower; • Water pump; • Major valves; • Air handling unit; • Generator; • Escalator; or • Gondola.
Types of Foundation Works	Foundation works including but not limited to the following: - <ul style="list-style-type: none"> • Shallow foundation (e.g., pad footings, raft footings, etc.); • Hand-dug cassion; • Flight auger piles; • Vertical minipiles; • Raking piles; • Bored piles – without bell-out; • Bored piles – with bell-out; or • Diaphragm wall.
Types of Ground Improvement Works	Ground improvement works including but not limited to the following: - <ul style="list-style-type: none"> • Hydraulic ground improvement works (e.g., provision of pumping wells, other dewatering methods, etc); • Ground freezing; • Chemical grouting • Stone column; • Deep cement mixing; • Inclusion and confinement method (e.g., fabric reinforcement, steel reinforcement concrete, etc.); or • Soil mixing. <p>Except for ground improvement works solely for the construction of seawall, which will be assessed under Module 3.M – Marine Works.</p>

<u>Terms</u>	<u>Definition</u>
Types of Slope Works	<p>Slope works including but not limited to the following: -</p> <ul style="list-style-type: none"> • Typical slope cutting (i.e., local trimming and removal); • Typical rock cutting; • Slope filling works; • Soil nailing works; • Installation of rock bolts/rock dowels; • Installation of temporary/permanent ground anchor; • Construction of retaining wall/buttress wall; • Soil improvement works (e.g., grouting, mass/no-fines concrete replacement, etc.); • Construction of piled wall; • Construction of flexible barrier; • Construction of boulder fence; • Construction of rigid barrier, close basin or check dam; • Construction of debris flow impediment; or • Other specialised construction methods (e.g., reinforced earth wall, etc.).
Types of Tunnelling Methods	<p>Tunnelling methods including but not limited to the following: -</p> <ul style="list-style-type: none"> • Hand dug tunnel; • Cut-and-cover tunnel; • Mined tunnel – drill and blast method; • Mined tunnel – drill and break method; • Tunnel boring machine (TBM) – slurry TBM; • Tunnel boring machine (TBM) – Earth Pressure Balancing (EPB) TBM; or • Box jacking/pipe jacking.

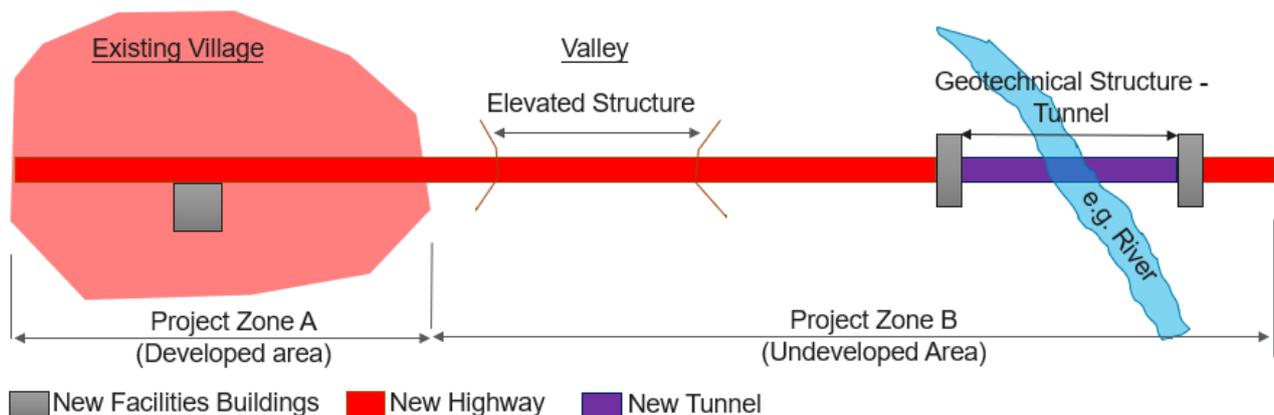
APPENDIX C

Example – Assessment on Project with Multi-Zoning Works

The Project Zone weighting recognizes the wider project constructability issues that might occur in Public Works Project such as the examples given in the table below:

Example 1	A 3km tunnel project with 500m to be constructed in reclamation, 2km under the sea and 500m under an existing village.
Example 2	A water treatment project with a water treatment plant, 900m of pressurized water main in green field site and 100m in a skew crossing under an existing highway.
Example 3	A slope works project with 10 works sites, seven in an open area, one in a country park and two within a housing estate.

For all three of these examples the Constructability issues for the project are constrained. Access to part of the Project Site will be limited and the ability to carry out detailed investigations such as ground investigations will be limited within parts of the Project Site. Rather than having the assessment for the entire project controlled by the constraints over a small portion of the Project Site in a holistic approach, the project may be sub-divided into Project Zones (as per the figure below) that can be assessed individually and combined to give an overall weighted assessment of the Constructability issues. The BES(E) Tool acknowledges the possibility of multi-zoning works that may impact the assessments made by the Users as illustrated the example below where the existing village constrains the ease of access and the freedom to position sizeable elements within the Site as identified in.



Project Zone A

An existing village constrains the ease of access and the freedom to position sizeable elements.

Project Zone B

An elevated structure and tunnel structure in undeveloped area.

Multi-zoning Works:

- Each Project Zone will be assessed separately for different site constraints, site planning and usage as shown below.

MODULE 2 Site Planning and Usage

Sub-Module 2.1 Sub-Module 2.2

Site Utilisation and Accessibility - 50% of Module 2

Each aspect will be assessed based on the characteristic of the Project Zone.

Description	Project Zone A	Project Zone B	Project Zone C	Project Zone D	Project Zone E	Remarks	% Gained
Preliminary/reference design is prepared to justify site layout:-							
(1) facilitates easy access and installation of sizeable elements within the Site	No	No	No	No	No		0.0%
(2) minimizes impact on geotechnical features	No	No	No	No	No		0.0%
(3) minimizes footprint encroaching onto slopes and any excavation/temporary shoring/slope strengthening	No	No	No	No	No		0.0%
(4) avoids or minimizes demolition	No	No	No	No	No		0.0%
(5) avoids or minimizes dredging	No	No	No	No	No		0.0%
(6) minimizes extent of tree transplantation/removal in terms of buildability and cost effectiveness – 3 aspects							
(a) Tree transplantation/removal is not required/is minimized	No	No	No	No	No		0.0%
(b) No Old and Valuable trees are impacted	No	No	No	No	No		0.0%
(c) Space made available for compensatory tree planting	No	No	No	No	No		0.0%
(7) minimizes extent of coral and ecological translocation in terms of buildability and cost effectiveness - 4 aspects							
(a) Coral relocation/ecological translocation is not required/is minimized	No	No	No	No	No		0.0%
(b) No mangroves are impacted	No	No	No	No	No		0.0%
(c) No unacceptable impacts on marine species (e.g., dolphins, horseshoe crabs, turtles) are generated	No	No	No	No	No		0.0%
(d) Space made available for translocation of protected species	No	No	No	No	No		0.0%

- Module 2 scores will be allocated to each Project Zone according to the relative costs of the works within each Project Zone.

PROJECT INFO

Project Reference No.

Project Title

Project Stage

Commencement Date

Original Completion Date Final Completion Date

Original Contract Sum HK\$ M Final Contract Sum HK\$ M

Total Man-Day

The assessment is then combined with the weighting based on the relative costs of works within the Project Zone.

Project Scope	Project Zone	Estimated Cost	Weighting	Remarks
Please input the estimated value of the five (5) most significant project zone of works.				
	Project Zone A	HK\$ <input type="text" value="1.00"/> M	20.00%	
	Project Zone B	HK\$ <input type="text" value="1.00"/> M	20.00%	
	Project Zone C	HK\$ <input type="text" value="1.00"/> M	20.00%	
	Project Zone D	HK\$ <input type="text" value="1.00"/> M	20.00%	
	Project Zone E	HK\$ <input type="text" value="1.00"/> M	20.00%	

APPENDIX D

Key considerations on qualitative assessments items

For conducting evaluation on qualitative assessments items in BES(E) Tool (i.e. Yes / No type questions), some guidelines are provided in the table below for reference. Please note that these guidelines are not restrictive and Users may have other considerations relevant to the specific nature of the project. Users should make reference to the relevant design information and the contract documents to complete the assessment. The Design Review Committee may also make reference to these guidelines in reviewing the design.

If the design does not involved in the extent described in the Assessment Items, “N/A” should be given. The score of these Assessment Items will be re-distributed to other items in the within the Sub-module.

Assessment items in Module 3 are in the form of quantitative assessments items based on the 3S+ Principle (i.e. “Standardisation”, “Simplification” and “Single Integrated Elements” plus the elements of project life cycle management and co-ordination). Users should make use of relevant design information in drawings and specifications to complete the assessment. Rules and calculation methods are provided in Appendix A of this Manual. Please note the Design Review Committee may also interest in areas of design with low buildability scores and/or comparatively high buildability scores contributed by imposed conditions.

Assessment Items	Key Considerations
Module 1	
Sub-Module 1.1	
(1) Achievable scope and contract period in accordance with ETWB TCW No. 19/2003.	(a) If the design review by Review Committee has been conducted for preliminary design before entering the detailed design stage. (b) If the action checklist provided in Appendix A of ETWB TCW No. 19/2003 has been completed for all preliminary designs.
(2) Construction Programme showing breakdowns of works activities.	If the programme showing the major events, with their respective time durations and sequencing / overlapping of works has been prepared. If the time durations, sequencing / overlapping of works shown in the programme are reasonable with due consideration of the contract requirements, such as site constraints and statutory procedures.
Sub-Module 1.2	
(1) Compliance on statutory requirement in PAH Chapter 4 on design approvals.	If the approvals (or approval in condition) as required in Section 4 of PAH Chapter 4 have been obtained.
(2) Adequate site investigation and incorporation of risks in contract documents	(a) If site investigation has been conducted and major risks have been identified; (b) If the risks concerned have been addressed. If not, if the residual risks have been clearly stated in the contract documents and provisions have been allowed to cater for such residual risks.

Assessment Items	Key Considerations
Module 1	
Sub-Module 1.2 (Cont'd)	
(3) Latest utilities records are available	If the latest information / records from relevant utility companies and government authorities are obtained.
(4) Latest topographical survey plans are available	If the designs are based on the latest topographical survey plans. These survey plans should sufficiently cover the area around the footprint of the proposed works.
(5) Essential services for construction works are available	(a) If it has been assessed that essential services (e.g. watermains, drainage discharge points, electricity, site access, etc.) for the works can be made available in a timely manner. (b) If relevant utility companies and government authorities have been consulted.
(6) Coordination on utility diversion schemes is completed	(a) If any coordination has been conducted with relevant utility companies and government authorities on temporary / permanent utilities diversion scheme. (b) If positive responses from these parties have been obtained.
(7) Sufficient information on demolition works is prepared	(a) If records of concerned structures have been obtained; (b) If the relevant government authorities have been consulted on the demolition scheme. (c) If the requirements of the demolition works have been specified in the contract documents.
(8) Coordination with facility management / maintenance party is conducted	(a) If coordination has been conducted with facility management / maintenance party on the proposed works. (b) If positive responses from these parties have been obtained.
Sub-Module 1.3	
(1) Compatible layouts with all disciplines of works incorporated	If it has been assessed that the designs of combined services / works in one critical location (or other areas if necessary) are compatible.
(2) Identify and resolve conflicts with services at critical locations	(a) If potential conflicts at critical locations have been identified. (b) If these potential conflicts have been resolved.
(3) Indication of complex interface and construction details in the contract documents	(a) If the designs involve complex interface and complex construction details. (b) If these details have been provided in the contract documents and provisions have been allowed in the contract documents to cater for any potential slippage arisen from these interface issues.

Assessment Items	Key Considerations
Module 1	
Sub-Module 1.4	
(1) Site constraints are identified and addressed in the design	(a) If major site constraints have been identified. (b) If these site constraints have been catered for in the design. (c) If provisions have been allowed in the contract documents to cater for these site constraints.
(2) Methodology and sequence of critical work items are assessed and considered	If the feasibility of the proposed construction methods / schemes for critical work items has been assessed with due consideration various factors, such as the advice from specialist, the availability of materials, skill and technique in the market, etc.
(3) Provision of site access is considered for all work fronts	Based on the proposed construction methods / schemes, if it has been assessed that proper accesses are available to all work-fronts.
(4) Reasonably sufficient works areas are provided	(a) Based on the proposed construction methods / schemes, if it has been assessed that sufficient works areas are available for the works, such as site offices, storage areas, prefabrication areas, stockpiling areas, or other areas necessary for the completion of the works. (b) If provisions have been allowed in the contract documents to cater for any potential delay in the availability of these works areas.
(5) Necessary measures of temporary utility arrangements are provided.	If the temporary utility arrangements (e.g. the requirements of diversion scheme, temporary structural support, change-over arrangement, etc.) have been provided in the contract documents.
(6) Facilitating multiple work-front construction	If the design facilitates multiple work-front arrangement in order to minimise site idling. Typical provisions are as follows:- (i) Arrange off-site prefabrication works (ii) Conduct the works by different working phases (iii) Arrange sequence of works such that parallel work fronts, such as top-down construction, tunnel excavation from both ends, can be introduced

Assessment Items	Key Considerations
Module 2	
Sub-Module 2.1	
Option / preliminary study on site position and/or formation level is carried out to:	
(1) facilitate construction access and logistics.	Based on the proposed construction methods / schemes, if it has been assessed that accesses within the site areas are not obstructed in any construction stage.
(2) minimize the generation of surplus excavated materials	<p>To minimise the generation of surplus excavated materials and public fill considering the followings:-</p> <p>(a) If the proposed works can reduce the generation of surplus excavated materials to less than 50,000m³.</p> <p>(b) Otherwise, if the C&DMMP had been completed and endorsed according to Section 4.1.3 of PAH Ch, 4.</p> <p>(c) If the proposed works will generate more than 300,000 m³ surplus excavated materials, “No” should be assessed in this item.</p>
(3) avoid major temporary traffic arrangement.	<p>If the works can avoid implementing temporary traffic arrangement in major roads or railways.</p> <p>Note:</p> <p>(i) Major roads refer to expressways and primary distributors and other special areas as specified by government departments, such as XPPM.</p> <p>(ii) For railways, assessment should be made if the works affect the railways operation although some works fall within the ambit of Railway Protection Zone.</p>
(4) avoid impact on main utilities and structures.	If the works can avoid the impact on main utilities and structures which would require temporary structural supports or structural modifications.
(5) facilitate easy access and delivery of sizeable construction plants to the Site and within the site areas.	If the design can facilitate easy delivery of sizeable elements, such as construction materials, plants, to all respective areas for constructions and installations.
(6) avoid underground works at complex geology or using long piles.	<p>(a) If the site falls within complex geological areas as specified in Geoguides, PNAP or other relevant technical circulars.</p> <p>(b) If yes, if adequate ground investigation works have been conducted and the works can avoid the encroachment of complex geological zones.</p> <p>(c) If the adoption of long piled foundation can be avoided.</p>

Assessment Items	Key Considerations
Module 2	
Sub-Module 2.2	
Preliminary / reference design is prepared to justify site layout:	
(1) facilitate easy installation of sizeable E&M plants with consideration of its maintenance and operations.	<p>If the sites have sufficient areas for the installation and operation of sizeable equipment.</p> <p>Components of the works are arranged where possible to allow space for the laydown, craneage and installation of large prefabricated units during construction and for their removal during replacement or demolition. Prefabricated units would include such elements as precast beams, precast segments, ventilation fans, transformers, gantries, ducts, or culverts etc.</p>
(2) minimize impact on geotechnical features.	<p>(a) If the proposed works designs demonstrate the best endeavors to minimize the impact on existing slopes, retaining walls or natural terrain.</p> <p>(b) If impact on existing slope cannot be avoided, whether the respective checking certificates on these slopes, retaining walls or natural terrain have been obtained.</p>
(3) minimize any temporary slope strengthening in the course of works	<p>If the designer has reviewed and considered the possible temporary works arrangement and minimize the impact on existing slopes, retaining walls and natural terrain due to temporary works.</p>
(4) minimize potential risks from demolition	<p>In case demolition works cannot be avoided, if the following items have been taken into account in the design:</p> <ul style="list-style-type: none"> (i) Survey on facilities, e.g. archeological, structural, building services and extent of hazard materials; (ii) Construction and demolition materials management plan (for projects specified in Section 4.1.3 of PAH) or similar plans for other projects. (iii) Minimizing the environmental impact. (iv) Provision of demolition drawings, plans and specifications in contract documents. If hazard materials are identified, requirements on the removal of such materials are included. <p>“N/A” should be filled if no demolition works anticipated.</p>

Assessment Items	Key Considerations
Module 2	
Sub-Module 2.2 (Cont'd)	
(5) minimize potential risks from dredging works	<p>In case dredging works cannot be avoided, if the following items have been taken into account in the design:</p> <ul style="list-style-type: none"> (i) Accepted proposal on minimizing environmental impact and obtained all required statutory approvals on the proposal. (ii) Provision of drawings and specifications in contract documents. If hazard materials are identified, requirements on the removal of such materials are included. <p>“N/A” should be filled if no dredging works anticipated.</p>
(6) minimizes extent of tree transplantation / removal in terms of buildability and cost effectiveness: <ul style="list-style-type: none"> (a) Tree felling, transplantation and substantial preservation is not required (b) No Old and Valuable Trees (OVTs) are affected (c) General requirements for tree works are provided. 	<ul style="list-style-type: none"> (a) If tree felling, transplantation and substantial preservation can be avoided. (b) If works affecting OVTs can be avoided. (c) In case tree works cannot be avoided, if the following items have been taken into account in order to reduce the risk to the tree works: <ul style="list-style-type: none"> (i) Accepted tree works proposal (e.g. TRA) and obtained all required statutory approval on tree works plans (ii) Provision of drawings and specifications of tree works in contract documents. (iii) Space is available for compensatory tree plantings. <p>“N/A” should be filled in part (b) and (c) if no tree works anticipated.</p>
(7) minimizes extent of ecological translocation in terms of buildability and cost effectiveness: <ul style="list-style-type: none"> (a) Relocations / translocations of ecological species are not required. (b) No mangroves are impacted (c) No adverse impacts on marine species (e.g. dolphins, horseshoe crabs, turtles) are generated 	<ul style="list-style-type: none"> (a) If relocation / translocation of ecological species can be avoided. (b) If impact on mangroves can be avoided. (c) If adverse impact on marine species (e.g. dolphins, horseshoe crabs, turtles) can be avoided. <p>[ecological species is equivalent to marine species?]</p>

Assessment Items	Key Considerations
Module 2	
Sub-Module 2.2 (Cont'd)	
<p>(7) minimizes extent of coral and ecological translocation in terms of buildability and cost effectiveness:</p> <p>(d) General requirements for protection on ecological species are met.</p>	<p>(d) In case ecological species cannot be affected, if the following items have been taken into account in order to reduce the risk;</p> <ul style="list-style-type: none"> (i) Accepted proposal and obtained all required statutory approval on works plans (ii) Provision of drawings and specifications of works in contract documents. (iii) Space is available for living / translocation of these species. <p>“N/A” should be filled in part (a) to (d) if the assessment of these aspects are not necessary.</p>
Module 4	
Sub-Module 4.1	
(A) Provide effective maintenance on accessibility	
(1) With adequate width, sizes, headroom & loading capacity, and maneuverable space.	If width, sizes, headroom & loading capacity, and maneuverable are sufficient in the proposed facilities for operation and maintenance.
(2) With a lower maintenance requirements and more effective recurrent cost.	<p>(a) By comparing the requirements from other similar facilities, if the proposed designs impose a trim down on requirements on facility management.</p> <p>(b) By comparing the re-current cost of other similar facilities, if the proposed designs require a lower re-current cost.</p>
(B) Provide effective maintenance on facilities	
(1) Adequate isolating route or backup equipment.	<p>(a) If there is any isolating route for maintenance equipment for contingency.</p> <p>(b) If backup equipment will be arranged to ensure the continuous operation of the facilities.</p> <p>“N/A” should be filled if no plant installation is involved in the contract.</p>
(2) Sufficient cleaning / draining / air ventilation systems	If designs on cleaning, drainage and / or air ventilation system is provided.
(3) Safety provisions for working in high risk	By providing suitable examples, if designers have already catered for safety in operation and maintenance and how the potential hazard can be minimized.

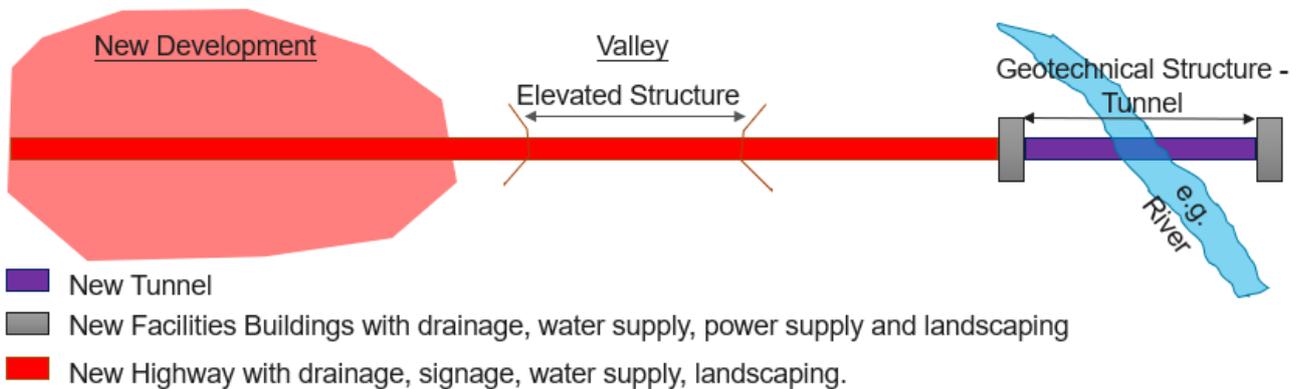
Assessment Items	Key Considerations
Module 4	
Sub-Module 4.2	
(1) Flexibility to alter the layout for future conversion, alteration and/or other improvement works.	If the design allows flexibility for change to suit future conversion, alternation and improvement works.
(2) Co-location and confinement of utilities	With the aid of layout plans and schematic diagrams, if common utility enclosures / compartments are provided in the facilities with adequate space for inspection and maintenance.
Sub-Module 4.3	
(1) Standardization of system / components / materials	With the aid of relevant specifications and catalogue for a critical design element, if standardized system, components are adopted.
(2) Ease of maintenance of the systems and replacement of components / materials.	With the aid of drawings, specifications, reference from similar facilities and operation manuals, if the maintenance of the systems and replacement of components / materials are easy.
(3) Components and materials should have good performance against wear and tear, weathering, discoloration, deformation and degradation	With the aid of specifications and catalogue, if the components and materials have good performance against wear and tear, weathering, discoloration, deformation and degradation.
Sub-Module 4.4	
(1) High quality components / materials with low maintenance requirements	With the aid of specifications and catalogue, and past examples, if the components and materials adopted attain a high lifetime performance.
(2) Components / materials are readily available in the market	If the materials adopted are readily available in the market. In some cases, availability of local suppliers should be considered.
Sub-Module 4.5	
(1) Adoption of QR codes, or other similar hardware for facility management.	If QR Codes or similar hardware will be introduced in the proposed facilities for a more effective facility management and record retrieval.
(2) Application of IT technology for facility management.	If any IT technology software will be introduced for a more effective facility management, such as in the respect of preventing, monitoring and mitigating damage as well as arranging timely maintenance and replacement.
(3) Adoption of RFID technology or other similar system for facilities management.	If RFID technology will be introduced for a more effective facility management, particularly in some inaccessible areas.
(4) Enabling real-time monitoring system for facilities management	If real-time monitoring system will be introduced for a more effective facility management.

APPENDIX E

Example – Assessment on Project with Multi-Disciplinary Works

The BES(E) encourages the multi-disciplinary works to be considered during assessments made by the Users. A scenario has is provided to illustrate the examples below:

The engineering components of Public Engineering Works Projects can vary widely in their nature and content. Examples of this variability might range from a mono-discipline project consisting of new drainage pipeline serving an existing development to a multi-discipline project for a new highway project serving a new town development. These widely varying projects have widely varying requirements for type and size of the engineering components:



• Single-discipline Project	• Multi-discipline Project
<ul style="list-style-type: none"> e.g. New Drainage Pipeline 	<ul style="list-style-type: none"> e.g. New Highway
<ul style="list-style-type: none"> - Drain pipes/ manholes 	<ul style="list-style-type: none"> - Roads - Bridges - Slopes - Retaining walls - Drain pipes/manholes - Water pipes

The BES(E) Tool must therefore can assess this range of discipline. To accommodate this range the Tool has broken the engineering disciplines down into basic engineering components that occur under the Work Types most common in Hong Kong Public Engineering Works Projects, namely:

- Geotechnical Works.
- Roadworks.
- Drainage Works.
- Water Works.
- Marine Works.
- Elevated Structure Works.
- Facilities Structures.

Under these are grouped the primary engineering components that shape the project and against which assessments of buildability of the individual aspects of the components can be made.

Works Categories	Engineering Components categories	Work types for Public Engineering Works				
		Highways and associated works	Drainage / sewerage works	Geotechnical works	Port works / marine structures	Water works
Geotechnical Works (G)	Slope Works	***	*	***		*
	Site Formation/ Earthworks	***		***	*	
	Foundation Works	***	*	***	*	*
	Ground Improvement Works	***		***	*	
	Tunnels, Caverns and Underground Space	***	***	***		***
Roadworks (R)	Carriageway, Cycletrack and Footpath	***	*	*	*	*
	Road Furniture	***	*	*	*	*
	Noise Barriers	***				
Drainage Works (D)	Pipelines	*	***	*	*	
	Manholes, Catchpits and other Drainage Facilities	*	***	*	*	
	Box Culverts	*	***		*	
	Nullahs, Engineered Channels, River Training Work		***			
Waterworks (W)	Pipelines	*	*	*	*	***
	Service Reservoirs			*		***
Marine Works (M)	Land Reclamation	*	*		***	*
	Wave Protection	*	*		***	*
	Pier/Jetty Structures				***	

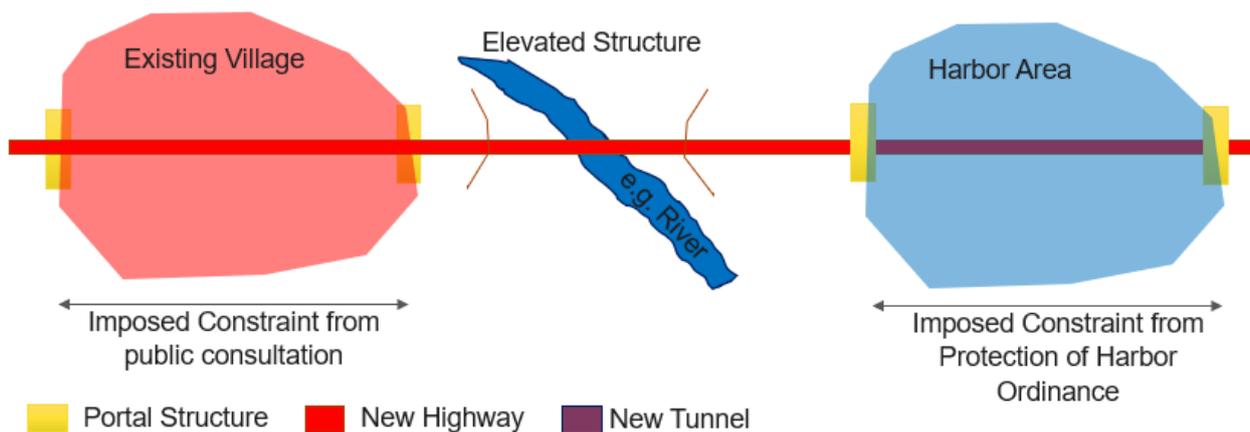
Works Categories	Engineering Components categories	Work types for Public Engineering Works				
		Highways and associated works	Drainage / sewerage works	Geotechnical works	Port works / marine structures	Water works
Elevated Structure Works (E)	Elevated Structure Works	***			***	*
	Parapets and Barriers	***				
	External Finishes / Façade	***				
Facility Structures (F)	Facility Structures Works	***	***	*	***	***
<p>*** - Anticipated as a primary engineering component of this type of public engineering works</p> <p>* - Anticipated as a secondary component of this type of public engineering works or not existing in the project.</p>						

APPENDIX F

Example – Assessment on Project with Imposed Conditions

In a similar manner to the impact of Project Zones on Constructability items the Buildability for the Engineering components of the project may be constrained by legal/social/environmental aspects rather than strict technical/commercial considerations.

Example 1	A highway project with part of the alignment passing across the harbour which is constrained by the statutory requirements of the Protection of the Harbour Ordinance (PHO) limiting construction methods to those not involving permanent or temporary reclamation.
Example 2	A highway project with part of the alignment passing across an existing village with sensitive community relation issues limiting construction methods to non-blasting methods.



For these two examples the selection of the most “buildable” method and details for the Works components are constrained by non-technical issues. The influence of these Imposed Conditions is taken into account within the Module 3 by compensatory BES(E) Score achieved following demonstration of complying with the Imposed Condition.

Illustration below explains how the mechanism of this compensatory BES(E) Score. In Example 2 above, given the imposed condition arisen by the existing village, Users may be required to choose a less buildable options to address the concerns imposed by the existing village and this will result in a lower BES(E) Score. Nonetheless, if Users could demonstrate that the following design considerations is incorporated in their design and the solution is optimised, 50% of the lost score will be restored to appreciate their effort on enhancing buildability of the project :-

- ease of construction;
- avoid/minimise of extensive temporary works; and
- appropriate prefabrication as much as possible.

In order to ensure this compensatory BES(E) Score system is not abused, if Users consider the design has met the abovementioned criteria, justifications on how it is achieved shall be provided in the column “Remarks” for the Vetting Committee’s consideration.

MODULE 3

Details of Design

Module 3.G-1 | Module 3.G-2 | Module 3.R | Module 3.D | Module 3.W | Module 3.M | Module 3.E | Module 3.F

Geotechnical Works

Description	Quantity	Unit	Remarks	% Gained
G1 - Slope Works				
1. Type of Slope Works				
No. of types of slope works involved in the project	2	nr.		20.0%
2. Selection of Slope Works				
Total area of projected elevated of slopes/retaining structures	10	sq. m		
Percentage area of projected elevation of slopes not requiring structural improvement works (only requiring	10	%		3.5%
Percentage area of projected elevation of slopes involving cutting back in soil slope	10	%		3.3%
Percentage area of projected elevation of slopes involving cutting back in rock slope	10	%		3.0%
Percentage area of projected elevation of slopes involving soil nailing works	10	%		3.2%
Percentage area of projected elevation of slopes involving soil filling works	10	%		2.6%
Percentage area of projected elevation of slopes involving installation of rock bolts/rock dowels	5	%		1.5%
Percentage area of projected elevation of slopes involving soil improvement works - bulk improvement	5	%		1.1%
Percentage area of projected elevation of slopes involving soil improvement works - improvement by pits	5	%		0.7%
Percentage area of projected elevation of retaining structures being constructed - without piles	5	%		1.1%
Percentage area of projected elevation of retaining structures being constructed - with piles	5	%		0.7%
Percentage area of projected elevation of reinforced earth wall being constructed	5	%		0.7%
Percentage area of projected elevation of flexible debris resisting barrier	5	%		0.7%
Percentage area of projected elevation of rigid barrier	5	%		0.7%
Any imposed condition? If yes, please input 1 in Quantity and provide justification in Remarks.	1			6.2%

For items we considered that will be affected by imposed conditions, a follow up question will be allowed.

MODULE 3

Details of Design

Module 3.G-1 | Module 3.G-2 | Module 3.R | Module 3.D | Module 3.W | Module 3.M | Module 3.E | Module 3.F

Geotechnical Works

Description	Quantity	Unit	Remarks	% Gained
G1 - Slope Works				
1. Type of Slope Works				
No. of types of slope works involved in the project	2	nr.		20.0%
2. Selection of Slope Works				
Total area of projected elevated of slopes/retaining structures	10	sq. m		
Percentage area of projected elevation of slopes not requiring structural improvement works (only requiring	10	%		3.5%
Percentage area of projected elevation of slopes involving cutting back in soil slope	10	%		3.3%
Percentage area of projected elevation of slopes involving cutting back in rock slope	10	%		3.0%
Percentage area of projected elevation of slopes involving soil nailing works	10	%		3.2%
Percentage area of projected elevation of slopes involving soil filling works	10	%		2.6%
Percentage area of projected elevation of slopes involving installation of rock bolts/rock dowels	5	%		1.5%
Percentage area of projected elevation of slopes involving soil improvement works - bulk improvement	5	%		1.1%
Percentage area of projected elevation of slopes involving soil improvement works - improvement by pits	5	%		0.7%
Percentage area of projected elevation of retaining structures being constructed - without piles	5	%		1.1%
Percentage area of projected elevation of retaining structures being constructed - with piles	5	%		0.7%
Percentage area of projected elevation of reinforced earth wall being constructed	5	%		0.7%
Percentage area of projected elevation of flexible debris resisting barrier	5	%		0.7%
Percentage area of projected elevation of rigid barrier	5	%		0.7%
Any imposed condition? If yes, please input 1 in Quantity and provide justification in Remarks.	1			6.2%

If Users consider sufficient effort has been allowed, input "1" in the column "Quantity" and 50% of the lost BES(E) Score of the related item will be restored.

APPENDIX G

Innovative Items

For obtaining the bonus score in Module 5 – Innovation and Creativity from the proposed innovative items, Users are required to take the following into account in making submission for consideration by Design Vetting Committee:

- (1) Whether the proposed innovative items are readily specified or described in any manuals, code of practices, guidelines in the territory;
- (2) Whether the proposed innovative items are commonly adopted in the market; and
- (3) Whether the proposed innovative items can achieve any of the 5 specific attributes, including:
 - (i) Reducing life-cycle cost,
 - (ii) Reducing Construction Period
 - (iii) Reducing Labour Intensity;
 - (iv) Reducing Reliance on Skilled Labour; and
 - (v) Enhancing Construction Safety.

The following table shows some considerations of potential innovation items as well as some items which appear no longer innovative. Please note this table is for reference only and may be updated from time to time.

Item(s) appear Innovative	Item(s) appear no longer innovative
<p>Some potential innovative items can be explored from the followings aspects:</p> <ol style="list-style-type: none"> (A) Robotic / Autonomous Systems (B) Advanced Materials (e.g. low carbon footprint materials, with benefit to carbon neutrality and/or de-carbonisation, self-healing materials carbon capturing materials) (C) Predictive Analytics for Streamlining construction and maintenance works (D) Applications by using cloud technology 	<p>In general, the following items have been explored / applied by some existing studies and appear no longer innovative:</p> <ol style="list-style-type: none"> (A) BIM (Building Information Modelling) and some extension application which are readily available in the market, e.g. <ul style="list-style-type: none"> - Point Cloud application - Facility management - Phase Modelling - VR (Virtual Reality) - AR (Augmented Reality); (B) Solar panels, wind turbine as types of renewable energy; (C) Soft lighting, LED, Smart Lamp System for energy saving purpose; (D) HDD (Horizontal directional drilling), TBM (Tunnel Boring Machine), box jacking technique (E) Off-Site Prefabrication (<i>Note: the assessment of prefabrications have been embedded in other Modules of BES(E) Tool</i>) (F) Prefabricated / Pre-Cast Materials (<i>Note: the assessment of prefabrications have been embedded in other Modules of BES(E) Tool</i>)

