



INSTITUTION OF ENGINEERS SINGAPORE

CHARTERED ENGINEER OF SINGAPORE

COMPETENCY STANDARD & ASSESSMENT STATEMENT

The Institution of Engineers, Singapore
Chartered Engineering Board
70 Bukit Tinggi Road
Singapore 289758

Tel: (65)-6469 5000
Fax: (65)-6467 1108

CONTENTS

PART 0 – RECORD OF REVISIONS	4
PART 1 - INTRODUCTION.....	5
1 REGISTRATION AS CHARTERED ENGINEER OF SINGAPORE	5
PART 2 - REGISTRATION POLICY	6
2 CHARTERED ENGINEERING BOARD (CEB).....	6
PART 3 - ELIGIBILITY REQUIREMENTS	7
3 REQUIREMENTS FOR REGISTRATION	7
4 PATHWAYS FOR REGISTRATION	7
5 INDUSTRY SECTOR OF ENGINEERING PRACTICE.....	8
PART 4 - COMPETENCY STANDARD	9
6 PATHWAY A - COMPETENCY STANDARD.....	9
7 PATHWAY B – COMPETENCY STANDARD	10
PART 5 - ASSESSMENT	12
8 ASSESSMENT	12
9 AVOIDANCE OF CONFLICT OF INTEREST	12
PART 6 - OBLIGATIONS OF AND RULES GOVERNING CHARTERED ENGINEER	13
10 BOUND BY RULES OF PROFESSIONAL CONDUCT	13
11 DISCIPLINARY ACTION	13
12 DISPUTE RESOLUTION	13

PART 7 - APPLICATION GUIDANCE	15
13 APPLICATION FORM	15
14 WHO IS ELIGIBLE TO APPLY	15
15 RENEWAL OF REGISTRATION	15
PART 8 - BIBLIOGRAPHY	16
ANNEX A – TECHNICAL SKILLS & COMPETENCIES FOR EACH OF THE INDUSTRY SECTORS.....	17
ANNEX B – ACCREDITED TECHNICAL & SKILLS COMPETENCIES ASSESSMENT CENTRES.....	18
ANNEX C - LIST OF INDUSTRY SECTORS.....	19
ANNEX D - CONTINUING PROFESSIONAL DEVELOPMENT (CPD) FRAMEWORK.....	20
ANNEX E – GRADUATE ATTRIBUTES PROFILES FOR WASHINGTON ACCORD GRADUATE	23
ANNEX F – CHARACTERISTICS OR INDICATORS OF EACH ELEMENTS OF COMPETENCY STANDARD.....	26
APPENDIX I – Professional Development Units for Structured and Unstructured Activities	30

PART 0 – RECORD OF REVISIONS

<u>Revision</u>	<u>Date of Revision</u>	<u>Page / Section</u>	<u>Purpose of Revision</u>
0	NA	All	Initial release
1	1 Sep 2023	Annex E & Annex F	Alignment of Graduate Attributes profiles for Washington Accord Graduate (Annex E) and characteristics or indicators of each elements of competency standard (Annex F) with the Graduate Attributes and Professional Competencies (GAPC) version 4 (approved by IEA on 21 Jun 2021)
2	1 Oct 2024	Section 12	The CEB is the authority for dispute resolution.

PART 1 - INTRODUCTION

1 REGISTRATION AS CHARTERED ENGINEER OF SINGAPORE

- 1.1 The registration for Chartered Engineer of Singapore by the Institution of Engineers Singapore (IES) is to recognise persons who have demonstrated that they are able to practise competently in their practice area.
- 1.2 The level of professional competency which IES's Chartered Engineer is expected to meet, is listed as Competency Standard in Part 4 of this Assessment Statement. This set of Competency Standards has been developed with reference to the Technical Skills & Competencies (TSCs) in the Skills Framework¹ and International Engineering Alliance's Attributes and Professional Competencies².
- 1.3 The IES will keep a register of Chartered Engineers, which will list individuals who have been registered as Chartered Engineers. These Chartered Engineers will be able to use the post-nominal "CEng(SG)" to their names.

¹ The Skills Framework can be downloaded from SSG's website: <https://www.skillsfuture.gov.sg/skills-framework>

² The Graduate Attributes and Professional Competencies of the International Engineering Alliance (IEA) can be downloaded from IEA's website: <https://www.ieagrements.org/about-us/key-documents/>

PART 2 - REGISTRATION POLICY

2 CHARTERED ENGINEERING BOARD (CEB)

- 2.1 For the purpose of the registration of Chartered Engineer of Singapore, the IES Council has constituted the Chartered Engineering Board (CEB). The CEB will manage the assessment and registration process, and approve engineers to be registered as Chartered Engineer of Singapore.**
- 2.2 The IES Council shall appoint Board Members of CEB who may be representatives from government, industry, relevant professional associations, or higher education institutions delivering engineering programs.**
- 2.3 CEB will approve the registration of each successful engineer by positive vote of more than half of the total number of Board Members in the CEB.**
- 2.4 The contact person for CEB is:
Secretary
Chartered Engineering Board
The Institution of Engineers, Singapore
70 Bukit Tinggi Road
Singapore 289758
Tel: (65) 64695000
Email: ceb@iesnet.org.sg**

PART 3 - ELIGIBILITY REQUIREMENTS

3 REQUIREMENTS FOR REGISTRATION

3.1 An engineer has to fulfil the following requirements in order to qualify for registration as Chartered Engineer:

- (i) member of IES;
- (ii) has met the criteria in either of the pathways for registration as stated in 4.1;
- (iii) has received recommendation to be a Chartered Engineer provided by his/her employer or user of service;
- (iv) attends an interview by the assessment panel;
- (v) agrees to pursue continuing professional development at a satisfactory level prescribed by the CEB; and
- (vi) agrees to be bound by the IES's Rules for Professional Conduct.

4 PATHWAYS FOR REGISTRATION

4.1 Engineers seeking registration as Chartered Engineer of Singapore through one of the following two pathways –

Pathway A

An engineer who meets the following criteria can qualify for registration as a Chartered Engineer –

- i) passed the Technical & Skills Competencies assessment for a specific industry sector (listed in Appendices) conducted by the CEB accredited assessment centre(s) listed in Annex B; and
- ii) passed the professional review interview conducted by the assessment panel appointed by the Sector Committee for the specific industry sector; and
- iii) obtained at least 8 years of relevant practical work experience as an engineer.

Pathway B

An engineer who meets the following criteria can qualify for registration as a Chartered Engineer –

- i) completed an engineering degree accredited by an organisation holding full membership of, and operating in accordance with the terms of, Washington Accord³ or any substantially equivalent academic degree programme recognised by the IES⁴; and

³ An extract of the graduate attributes profiles for Washington Accord Graduate is in Annex E.

⁴ A list of qualifications that has been deemed as substantially equivalent to an engineering degree programme can be found in IES's website on registration as Chartered Engineer of Singapore.

- ii) passed the professional review interview conducted by the assessment panel appointed by the Sector Committee for the specific industry sector; and
- iii) obtained at least 4 years of relevant practical work experience as an engineer.

5 INDUSTRY SECTOR OF ENGINEERING PRACTICE

- 5.1 CEB will identify and approve a list of recognised engineering practice from various industry sectors and an engineer shall be assessed under a recognised engineering practice in the list. (The list of industry sectors of engineering practices, as shown in Annex C, will be updated to include new industry sectors as necessary.) The registration of Chartered Engineers will be based on the engineering practice in the industry sector.

PART 4 - COMPETENCY STANDARD

6 PATHWAY A - COMPETENCY STANDARD

6.1 The Competency Standard⁵ is the ability to perform at the level of Technical Skills & Competencies that represents broad practice areas of professional engineering performance. These levels of Technical Skills & Competencies are adapted from the Skills Framework.

6.2 The Competency Standard of Chartered Engineer to be referred is pegged to level 5 or 6 of Technical Skills & Competencies and is shown in Table 6.1 below.

Table 6.1

Level	Responsibility (Degree of supervision and accountability)	Autonomy (Degree of decision-making)	Complexity (Degree of difficulty of situations and tasks)	Knowledge and Abilities (Required to support work as described under Responsibility, Autonomy and Complexity)
5	Accountable for achieving assigned objectives, decisions made by self and others.	Provide leadership to achieve desired work results; Manage resources set milestones and drive work	Complex	<ul style="list-style-type: none"> • Evaluate factual and advanced conceptual knowledge within a field of work, involving critical understanding of theories and principles • Select and apply an advanced range of cognitive and technical skills, demonstrating mastery and innovation to devise solutions to solve complex and unpredictable problems in a specialised field of work • Manage and drive complex work activities
6	Accountable for significant area of work, strategy or overall direction.	Empower to chart direction and practice within and outside if work (including professional field/community), to achieve/exceeded work results	Complex	<ul style="list-style-type: none"> • Synthesise knowledge issues in a field of work and the interface between different fields, and create new forms of knowledge • Employ advanced skills to solve critical problems and formulate new structures, and/or to redefine existing knowledge or professional practice • Demonstrate exemplary ability to innovate, and formulate ideas and structures

⁵ Competency Standard is an indication of level of performance expected of a professional engineer.

- 6.3 Details of the knowledge and abilities for each of the Technical Skills & Competencies in each of the industry sectors are provided in the Appendices.
- 6.4 Only assessment centres with assessment programme accredited by CEB are allowed to carry out assessment for each of the Technical Skills & Competencies. The list of assessment centres with accredited assessment programme is shown in Annex B.

7 PATHWAY B – COMPETENCY STANDARD

- 7.1 The Competency Standard is the ability to perform 12 elements that represent broad practice areas of professional engineering performance. These elements are adapted from the professional competencies outlined in International Engineering Alliance’s “Graduate Attributes and Professional Competencies” for the class of professional engineer.
- 7.2 These 12 elements comprise the following:

S/N	Descriptor	Elements
1.	Comprehend and apply Knowledge	Comprehend and apply advanced knowledge of the widely-applied principles underpinning good practice to the local practice
2.	Problem analysis	Define, investigate and analyse complex problems
3.	Design and develop solutions	Design or develop solutions to complex problems
4.	Evaluation	Evaluate the outcomes and impacts of complex activities
5.	Protection of society	Recognise the reasonably foreseeable social, cultural and environmental effects of complex activities generally, and have regard to the need for sustainability; recognise that the protection of society is the highest priority
6.	Legal and regulatory	Meet all legal and regulatory requirements and protect public health and safety in the course of his or her activities
7.	Ethics	Conduct his or her activities ethically
8.	Manage engineering activities	Manage part or all of one or more complex activities
9.	Communication	Communicate clearly with others in the course of his or her activities

10.	Lifelong learning	Undertake Continuing Professional Development (CPD) activities sufficient to maintain and extend his or her competence
11.	Judgement	Recognize complexity and assess alternatives in light of competing requirements and incomplete knowledge. Exercise sound judgement in the course of his or her complex activities
12.	Responsibility for decisions	Be responsible for making decisions on part or all of complex activities

- 7.3 Examples of characteristics or indicators of each of these elements that the assessors will be looking for are given in Annex F.
- 7.4 It is expected that an engineer would typically require at least 4 years of practical working experience in order to acquire these elements of professional competencies.

PART 5 - ASSESSMENT

8 ASSESSMENT

8.1 CEB will appoint the Chair who will form the Sector Committee for the industry sector to review and assess applications for registration as Chartered Engineer. Sector Committee must be approved by CEB.

8.2 **Pathway A** - The Sector Committee might appoint one or more independent assessors to be part of the assessment panel to evaluate the engineer on his/her Technical & Skills Competencies of the specific industry sector. The Sector Committee will appoint an assessment panel, comprising a Lead Assessor and 2 Assessors who are Senior Chartered Engineers or Chartered Engineers to review and assess applications to be placed on the Chartered Engineer register. The lead assessor of each of assessment panel shall be members of the Sector Committee. The assessment by the appointed assessment panel shall include a professional review interview with the engineer. The assessment panel will submit their evaluation results to the Sector Committee; or

Pathway B - The Sector Committee will appoint an assessment panel, comprising a Lead Assessor and 2 Assessors who are Senior Chartered Engineers or Chartered Engineers to review and assess applications to be placed on the Chartered Engineer register. The lead assessor of each of assessment panel shall be members of the Sector Committee. The assessment by the appointed assessment panel shall include a professional review interview with the engineer. The assessment panel will submit their evaluation results to the Sector Committee.

8.3 The Sector Committee will make their recommendations to CEB on whether an engineer should be registered through a review of the application form and documents therein.

9 AVOIDANCE OF CONFLICT OF INTEREST

9.1 In order to avoid possible conflict of interest, members of the assessment panel are not expected to have or have had a close, active association with the engineer or his/her work experience. Close/active association are, for example

- a) being a relative of the engineer by birth or marriage;
- b) being in a position of financial or personal interest, either currently or within the past 6 years, directly related to the engineer; and
- c) being employed, either currently or within the past 6 years, as staff or consultant by the organisation in which the engineer's work experience was obtained.

PART 6 - OBLIGATIONS OF AND RULES GOVERNING CHARTERED ENGINEER

10 BOUND BY RULES OF PROFESSIONAL CONDUCT

- 10.1 Chartered Engineers of Singapore are assessed for skills & competencies in their domain of engineering practice in a specific industry sector. Chartered Engineers shall therefore not claim competency by virtue of their registration as Chartered Engineer in other areas of engineering practice that lie outside their area of expertise
- 10.2 Chartered Engineers are bound by the IES's Rules for Professional Conduct.
- 10.3 Chartered Engineers are required to maintain their continuing professional development at a satisfactory level, which should not be less than the level as prescribed by the CEB in Annex D. CEB may carry out random audit (of between 2% and 5% of records for the past year) of participation in CPD programme.

11 DISCIPLINARY ACTION

- 11.1 A complaint against any Chartered Engineer relating to contravention of the rules of professional conduct shall be lodged with the Secretary of the CEB.
- 11.2 If CEB has determined the complaint to be bona fide, CEB will set up an Investigation Committee to investigate into the complaint and make recommendations to the CEB.
- 11.3 Any action to be taken by the CEB against the Chartered Engineer, including removal from the register, shall not be taken unless the Chartered Engineer has been given an opportunity of being heard.

12 DISPUTE RESOLUTION

- 12.1 An engineer may appeal against the refusal to be placed on the register.
- 12.2 A Chartered Engineer may appeal against the decision of the CEB to remove him/her from the register.
- 12.3 An appeal must be made in writing to the Secretary of CEB within 30 days after receiving notification of refusal or removal. The appeal should be accompanied by a clear statement of the grounds for appeal.

- 12.4 The CEB will appoint an Appeal Committee comprising not less than 3 members to consider the appeal and to submit its findings and recommendations within 60 days.**
- 12.5 The CEB will consider the findings of the Appeal Committee and arrive at a final decision within 90 days after the formation of the Appeal Committee.**
- 12.6 If the appeal is denied, the CEB will provide the appellant with reasons for the decision.**
- 12.7 If a review of the registration is necessary, the CEB will appoint another Assessment Panel to carry out the review.**
- 12.8 If appeal for reinstatement on the register is successful, CEB will reinstate the Chartered Engineer on the register.**
- 12.9 The CEB may impose a fee for lodgement of an appeal. The fee will be refunded to appellant's membership account if the outcome is in appellant's favour, but there will be no refund if the original decision is upheld.**

PART 7 - APPLICATION GUIDANCE

13 APPLICATION FORM

13.1 The Application Form is available for download from the IES web site.

14 WHO IS ELIGIBLE TO APPLY

14.1 Application for registration as Chartered Engineer is open to both members and non-members of IES.

14.2 CEB may refuse to register an engineer who in its opinion is not of good character or reputation.

15 RENEWAL OF REGISTRATION

15.1 Every Chartered Engineer who wishes to renew his/her registration has to fulfil the following requirements:

- a) Obtain a minimum of 40 PDUs every year over the renewal qualifying period
- b) Update particulars on the IES Chartered Engineer database
- c) Pay the IES Chartered Engineer renewal fee
- d) Make the necessary declarations in the renewal application form.

15.2 Refer to Annex D for more details.

PART 8 - BIBLIOGRAPHY

- 1. International Engineering Technologist Agreement Version 1.4**
- 2. Agreement for International Engineering Technicians Version 1.4**
- 3. International Engineering Alliance – “Graduate Attributes and Professional Competencies”, June 2013**
- 4. IPENZ – Chartered Professional Engineer Competence Standard**
- 5. The Institution of Mechanical Engineers, UK – Chartered & Incorporated Engineers Application Guidance**
- 6. The Professional Engineers Board, Singapore – Continuing Professional Development for Professional Engineers**
- 7. Skills Framework - <https://www.skillsfuture.sg/skills-framework>**

ANNEX A – TECHNICAL SKILLS & COMPETENCIES FOR EACH OF THE INDUSTRY SECTORS

A.1 Skills Framework

A1.1 In the Skills Framework, there is a unique set of Technical Skills & Competencies (TSCs) for each of the industry sectors. In each set of TSCs, there are TSC map and reference documents as shown in the Appendices

A1.2 To be Chartered Engineer, he/she has to pass the assessment for the set of TSCs stipulated in the Appendices for the particular industry sector. The assessment on the set of TSCs is conducted by the assessment centres as listed in Annex B.

ANNEX B – ACCREDITED TECHNICAL & SKILLS COMPETENCIES ASSESSMENT CENTRES

B.1 The following are accredited Technical & Skills Competencies assessment centres which have been approved by the CEB:

Sector	Assessment Centre	Effective Date
Nil	Nil	Nil

ANNEX C - LIST OF INDUSTRY SECTORS

Industry Sector	Start of Registration
Aerospace	May 2023
Built Environment	May 2023
Chemical & Energy	May 2023
Engineering Project Management	May 2023
Environmental & Water	May 2023
Infrastructure	May 2023
Railway & Transportation	May 2023
Renewable Energy	May 2023
Sustainability	May 2023
Systems	May 2023

ANNEX D - CONTINUING PROFESSIONAL DEVELOPMENT (CPD) FRAMEWORK

D1 CPD Policy

D1.1 In the prevailing fast changing environment, there is a need for Chartered Engineers in Singapore to pursue lifelong learning to maintain and update their professional competence on a continuing basis.

D1.2 As a Chartered Engineer may be operating under circumstances which are unique to him/her, the focus of the CPD activities is best left to each Chartered Engineer to decide. The principle is that the relevant CPD activities must be those related to the scope of practice of each Chartered Engineer. There is therefore no prescribed rules as to the nature and type of activities to be undertaken but each Chartered Engineer will be given the flexibility to select from amongst a broad range of activities. The range of activities in this CPD programme is not intended to be exhaustive but to act as a general guide. The activities that would be relevant are those that will enable one to

- a) maintain, improve, or expand his/her technical skills and knowledge;
- b) keep abreast of changing procedures and standards;
- c) understand and apply advances in technology;
- d) better serve the engineering profession, community and environment;
- e) develop communication and management skills; and
- f) broaden into related fields, such as those covering management, financial or legal aspects.

D2 Definitions

D2.1 The terms used in this document have the following meanings

- a) “contact hour” refers to an attendance or involvement lasting one hour;
- b) “professional development units” or “PDU” refers to the unit of measure for effort in continuing professional development program;
- c) “renewal qualifying period” refers to a 24-month period immediately preceding the application for renewal of registration;
- d) “structured activity” refers to a 12-month period immediately preceding the application for renewal of registration;

- e) “unstructured activity” refers to an activity that involves self-directed learning, reading, discussion or participation.

D3 Requirement

- D3.1 Every Chartered Engineer who wishes to renew his registration is required to obtain a minimum of 40 PDUs over the renewal qualifying period. The 40 PDUs shall comprise a minimum of 15 PDUs in structured activities.
- D3.2 The determination of PDUs in structured and unstructured activities is shown in Appendix I.

D4 Carrying over of excess PDUs

- D4.1 If a Chartered Engineer exceeds the biennial requirement in one renewal qualifying period, a maximum of 40 PDUs from excess PDUs obtained from structured activities may be carried forward into the next renewal qualifying period.

D5 Insufficient PDU for renewal of registration

- D5.1 A Chartered Engineer who has not obtained sufficient PDUs in the renewal qualifying period to meet the requirement for renewal of his registration may apply to have his registration renewed by providing reasons for the failure to meet the requirement. The CEB may renew his/her registration and may impose a condition that the shortfall in PDUs in that renewal qualifying period has to be obtained during the following renewal qualifying period. The PDUs to be obtained in the next renewal qualifying period to meet the shortfall would not be used for the renewal of the registration for the next renewal period.

D6 Reinstatement after a lapse of 3 years

- D6.1 A Chartered Engineer whose registration had lapsed for 3 years or more is required to obtain 80 PDUs within renewal qualifying period, of which at least 30 PDUs must be obtained from structured activities.

D7 Exemptions

- D7.1 A Chartered Engineer may be exempted, subject to review and approval of the CEB, from CPD requirements if he/she experiences physical disabilities, prolonged illness or other extenuating circumstances.

D8 Records

- D8.1 When applying for renewal of registration, a Chartered Engineer is to submit the Biennial Renewal Form (which can be downloaded from the

IES web site) which contains a form to record the PDUs obtained during the renewal qualifying period. Chartered Engineers do not have to submit documentary evidence together with the Biennial Renewal Form. However, Chartered Engineers are advised to retain their CPD documentary evidence for a period of at least 2 years.

D9 Audit Process

D9.1 CEB will conduct random audit on compliance with CPD. Those selected will be asked to produce documentary evidence of their CPD participation during the particular period. The documentary evidence may take any one of the following forms:

- a) Summary of diary records or a log showing the activities claimed;
- b) Course enrolment record;
- c) Receipts;
- d) Certificate of attendance;
- e) Attendance list from course organiser;
- f) Employer's report or certification.

D10 Accreditation of structured activities

D10.1 Structured activities qualifying under Category 1 can be those accredited by the PEB or the IES. All activities that are accredited by the PEB are posted on the PEB's website, while those accredited by the IES will be posted on the IES website.

ANNEX E – GRADUATE ATTRIBUTES PROFILES FOR WASHINGTON ACCORD GRADUATE

S/N	Descriptor	Differentiating Characteristics	Washington Accord Graduate
1.	Engineering Knowledge	Breadth, depth and type of knowledge, both theoretical and practical	Apply knowledge of mathematics, science, engineering fundamentals and an engineering as specified in WK1 to WK4 ⁶ respectively to develop solutions to complex engineering problems
2.	Problem Analysis	Complexity of analysis	Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development (WK1 to WK4 ⁶)
3.	Design/ development of solutions	Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified	Design creative solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (WK5 ⁶)
4.	Investigation	Breadth and depth of investigation and experimentation	Conduct investigations of complex engineering problems using research methods including research based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to

⁶ Washington Accord Program Profiles: Knowledge and Attribute
(<https://www.ieagreements.org/about-us/key-documents/>)

			provide valid conclusions (WK8 ⁶)
5.	Modern Tool Usage	Level of understanding of the appropriateness of technologies and tools	Create, select and apply and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities (WK2 and WK6 ⁶).
6.	The Engineer and the World	Level of knowledge and responsibility for sustainable development	When solving complex engineering problems, analyse and evaluate sustainable development impacts* to society, the economy, sustainability, health and safety, legal frameworks, and the environment (WK1, WK5, and WK7 ⁶)
7.	Ethics	Understanding and level of practice	Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (WK9 ⁶)
8.	Individual and Collaborative Team work	Role in and diversity of team	Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings (WK9 ⁶)
9.	Communication	Level of communication according to type of activities performed	Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.
10.	Project Management and Finance	Level of management required for differing types of activity	Apply knowledge and understanding of engineering and management principles and economic decision-making and apply these to

			one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
11.	Lifelong learning	Duration and manner	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8 ⁶)

ANNEX F – CHARACTERISTICS OR INDICATORS OF EACH ELEMENTS OF COMPETENCY STANDARD

S/N	Descriptor	Elements	Characteristics or Indicators
1.	Comprehend and apply local and universal knowledge	Comprehend and apply advanced knowledge of the widely-applied principles underpinning good practice to the local and specific to the jurisdiction of practice	<ul style="list-style-type: none"> • Pursuit of post-graduate study or further learning to broaden knowledge and apply new knowledge • Work done to broaden knowledge of codes, standards and specifications • Work from first principles to make reliable predictions of outcomes • Seek advice, where necessary, to supplement own knowledge and experience • Use evidence from best practice within the local and its jurisdiction of practice to improve effectiveness
2.	Problem analysis	Define, investigate and analyse complex problems using data and information technologies where applicable	<ul style="list-style-type: none"> • Develop specification and procurement of new engineering products, processes and systems • Identify and define the scope of the problem • Investigate and analyse complex problems using data and information technologies • Test analysis for correctness of results • Conduct any necessary research and reach substantiated conclusions
3.	Design and development of solutions	Design or develop solutions to complex problems considering a variety of perspectives and taking account of stakeholder views	<ul style="list-style-type: none"> • Develop criteria for evaluating design solution • Identify needs, requirements, constraints and performance criteria • Develop concepts and recommendations that were tested against engineering principles

			<ul style="list-style-type: none"> • Evaluate options and selects solution that best matched needs, requirements and criteria • Plan and implement effective, efficient and practical systems or solutions • Consider a variety of perspectives and taking account of stakeholder views in the process of designing and developing the solutions to the complex problems.
4.	Evaluation	Evaluate the outcomes and impacts of complex activities	<ul style="list-style-type: none"> • Evaluate outcomes against original specifications • Learn from feedback on results to improve future design solutions and build best practice • Identify and manage risks through 'elimination, minimisation and avoidance' techniques
5.	Protection of society	Recognise the foreseeable social and environmental effects of complex activities and seek to achieve sustainable outcomes	<ul style="list-style-type: none"> • Develop and implement appropriate hazard identification and risk management systems to manage safety and hazards • Develop and implement environmental impact assessments, or environmental risk assessments • Consider and takes into account possible social and environmental impacts • Understand and facilitate stakeholder involvement in sustainable development to achieve sustainable outcomes • Recognises impact and long-term effects of engineering activities on the environment
6.	Legal, regulatory and cultural	Meet all legal and regulatory, and cultural requirements and protect public health and safety in the course of all activities	<ul style="list-style-type: none"> • Demonstrate understanding and work within all relevant legislation, regulatory and cultural frameworks

7.	Ethics	Conduct activities ethically	<ul style="list-style-type: none"> • Demonstrate understanding of and comply with the rules of professional conduct of the IES • Act with integrity and honesty
8.	Manage engineering activities	Manage part or all of one or more complex activities	<ul style="list-style-type: none"> • Organise and lead work teams, coordinating project activities • Work in cross-disciplinary team involving complex projects • Plan, schedule and organise projects to deliver specified outcomes • Apply appropriate quality assurance techniques • Manage resources, including personnel, finance and physical resource constraints • Manage conflicting demands and expectations • Apply continuous improvement through quality management
9.	Communication and collaboration	Communicate and collaborate using multiple media clearly and inclusively with a broad range of stakeholders in the course of all activities.	<ul style="list-style-type: none"> • Prepare and deliver presentations on strategic matters • Communicate and collaborate with a broad range of stakeholders inclusively using multiple media suitable to the audience and context • Treat people with respect • Develop empathy and use active listening skills when communicating with others • Operate effectively as a team member
10.	Continuing professional development (CPD) & Lifelong learning	Undertake Continuing Professional Development activities to maintain and extend competences and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.	<ul style="list-style-type: none"> • Maintain evidence of competence development • Demonstrate a commitment to extending and developing knowledge and skills • Participate in education, training, mentoring or other programmes contributing to professional development • Update knowledge base in the course of professional practice

			<ul style="list-style-type: none"> • Adapt to emerging technologies and the ever-changing nature of work
11.	Judgement	Recognize complexity and assess alternatives in light of competing requirements and incomplete knowledge. Exercise sound judgement in the course of all complex activities	<ul style="list-style-type: none"> • Demonstrate ability to identify and choose alternative options and justify decisions • Peer's recognition of ability to exercise sound professional engineering judgement
12.	Responsibility for decisions	Be responsible for making decisions on part or all of complex activities	<ul style="list-style-type: none"> • Demonstrate understanding of responsibilities involved when making engineering decisions • Take accountability for outputs • Accept responsibility for engineering activities

APPENDIX I – Professional Development Units for Structured and Unstructured Activities

Requirement:	A minimum of 40 PDUs over a renewal qualifying period of 12 months, of which a minimum of 15 PDUs must be from structured activities.
Determination:	Structured Activities are listed in Table 1 and Unstructured Activities are listed in Table 2.

Table 1 – Structured Activities

Category	Criteria	PDUs
Category 1(a): Accredited formal study courses	Relevant post-graduate or diploma courses on engineering and/or construction/project management. Example: a) MSc (Engineering) b) MSc (Project Management)	1 PDU for each contact hour
Category 1(b): Accredited lectures, short courses, conferences, workshops & seminars	Lectures, short courses, conferences, workshops & seminars which are relevant for professional engineers on technical, management, professional development, legal or regulatory matters. Examples: a) Seminars on regulatory requirements by government agencies e.g. BCA, FSB, ENV, LTA, etc. b) “Engineers and the Law” by IES c) Workshops and seminars on engineering topics by NUS or NTU	1 PDU for each contact hour
Category 1(c): Accredited in-house training	Structured in-house training which is relevant to professional engineers on technical, management, professional development, legal or regulatory matters. [CV of speakers to be similar to category 1(a) or 1(b)]	1 PDU for each contact hour
Category 2: Participation in Professional Boards, Committees and Societies	a) Member of Boards of local Professional institutions or relevant government agencies Examples: i) Board Member of BCA, LTA, HDB, URA, JTC, PEB and BOA ii) Council Member ACES and IES	8 PDUs per organisation

	<p>b) Member of relevant technical or working committees of professional associations and government agencies</p> <p>Examples:</p> <p>i) Member of Technical Committees of government departments and Statutory Boards;</p> <p>ii) Member of technical or other working committees of ACES & IES;</p> <p>iii) Member of approved technical societies.</p>	<p>4 PDUs per Committee (Maximum for this category is 8 PDUs)</p>
<p>Category 3: Contribution to relevant engineering or management Knowledge</p>	<p>a) Carry out the role of lead assessor or assessor in the assessment panel to evaluate the applicants.</p>	<p>1 PDU per applicant (Maximum for category 3a is 8 PDUs)</p>
	<p>b) Conduct accredited lectures, seminars, conferences or training courses for the first time. (Exclude regular lectures by full-time lecturers)</p>	<p>4 PDUs for each lecture hour or part thereof</p>
	<p>c) Conduct accredited lectures, seminars, conferences or training courses after the first time (Exclude regular lectures by full-time lecturers)</p>	<p>2 PDUs for each lecture hour or part thereof</p>
	<p>d) Write or edit technical articles or papers published in distinguished publications, conference proceedings, professional journals or books</p>	<p>5 PDUs for each topic</p>
	<p>e) Engineering patents registered during the year</p>	<p>15 PDUs for each patent</p>

Table 2 – Unstructured Activities

Category	Criteria	PDUs
<p>Category A: Self-study of relevant topics</p>	<p>i) Reading of relevant technical, professional, financial, legal or business literature</p>	<p>1 PDU for every 2 hours (Maximum for this category is 16 PDUs)</p>
	<p>ii) Listening/viewing audio/video tapes on relevant topics or taking correspondence courses</p>	
<p>Category B: Informal In-house training and discussion</p>	<p>i) Conducting informal in-house training and presentations to colleagues.</p>	<p>1 PDU for every 2 hours (Maximum for this category is 16 PDUs)</p>
	<p>ii) Attending informal in-house training and presentations</p>	
<p>Category C: Professional Membership</p>	<p>Membership of professional engineering or management bodies</p>	<p>2 PDUs per organisation</p>

		(Maximum for this category is 16 PDUs)
Category D: Non- accredited engineering activities	i) Attending professional and technical courses which are not accredited	1 PDU for every 2 hours
	ii) Attending organised group technical site visits and exhibitions	(Maximum for this category is 16 PDUs)