INSTITUTION OF ENGINEERS SINGAPORE

APEC ENGINEER

ASSESSMENT STATEMENT

Institution of Engineers, Singapore
APEC Engineer Monitoring Committee
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INTRODUCTION

1 The APEC Engineer

1.1 An APEC Engineer is defined as a person who is recognised as a professional engineer within an APEC economy, and who has satisfied an authorised body in that economy, operating in accordance with the criteria and procedures prescribed in The APEC Engineer Manual – The Identification of Substantial Equivalence, a copy of which is available on APEC web site at: http://www.apec.org/apec/publications/all_publications/human_resources_development.MedialibDownload.v1.html?url=/etc/medialib/apec_media_library/downloads/workinggroups/hrdwg/pubs/2000.Par.0002.File.v1.1.

2 Objective of APEC Engineer Register

2.1 Each authorised body, called the Monitoring Committee, in an APEC economy will arrange to provide timely and accurate information on the status of any practitioner claiming to be listed on its APEC Engineer Register to any person or organisation having a legitimate need for access to such information, to exchange relevant data with the other authorised Monitoring Committees, and, within their economy, to function as a single point of contact on all matters relating to APEC Engineers.

2.2 Each authorised Monitoring Committee further undertakes to:

a) accept and promote the substantial equivalence of the competence of APEC Engineers registered by other authorised Monitoring Committees;

b) make every reasonable effort to ensure that the bodies responsible for registering or licensing professional engineers to practise within their economy recognise that APEC Engineers have general technical and professional competence substantially equivalent to that of engineers already registered or licensed in that economy;

c) ensure that all practitioners registered by them as APEC Engineers comply fully with the requirements specified in the APEC Engineer Framework, and that a substantial majority of these practitioners have demonstrated their compliance through the primary procedures and criteria set out in the Assessment Statement for that economy;

d) ensure that practitioners applying for registration as an APEC Engineer are required to provide evidence that they have engaged in an appropriate level of recent continuing professional development; and

e) ensure that practitioners registered by them as APEC Engineers apply from time to time for renewal of their registration, and, in so doing, provide evidence that they have engaged in an appropriate level of recent continuing professional development.

2.3 The Monitoring Committees in each APEC economy recognise that a mutual exemption framework, which would confer exemption, in whole or in part, upon APEC Engineers from further assessment by the statutory bodies that controlled the right to practise in each participating economy, can be concluded only with the involvement and consent of those statutory bodies and the relevant governments. Only complete or partial exemption of APEC Engineers from the assessment mechanisms operating in the host jurisdiction is at issue, not exemption from the requirement to become licensed or registered in the economy concerned.

3 Purpose of Assessment Statement

3.1 This Assessment Statement provides a framework for the assessment of qualified professional engineers for placement on the APEC Engineer Register by Singapore's Monitoring Committee.

PART A:
THE MONITORING COMMITTEE

4 Background on engineering institutions in Singapore

The Institution of Engineers Singapore (IES)

4.1 The Institution of Engineers Singapore is the national society of engineers for the advancement of engineering in Singapore. Its mission is to advance and to promote the science, art and the profession of engineering for the well-being of mankind and national development of Singapore. Its objectives are:

i) to enhance the character and status and to advance the interest of the profession of engineering and those engaged therein;
ii) to promote honourable practice and mutual respect, and to decide all questions of engineering practice and etiquette affecting members of the Institution;
iii) to provide quality service to its members and the nation; and
iv) to provide opportunity for continuing professional development and promote fellowship among members.

The Association of Consulting Engineers Singapore (ACES)

4.2 The Association of Consulting Engineers Singapore is a non-profit making association representing the independent consulting engineering profession in Singapore. Formed in 1971, the association is an industry grouping seeking to set and maintain standards of professional ethics, public accountability and independence amongst its members who are all directors or partners of consulting engineering firms operating in Singapore in compliance with the Professional Engineers Act and its regulations. ACES also has business interests of its members high on its agenda and seeks to ensure that professional consulting engineers in Singapore are adequately and fairly rewarded for their services. The objects for which the Association is established are:

i) to promote the advancement of the profession of Consulting Engineering.
ii) to associate together for the purpose of cooperation and mutual advantage and consultation as Consulting Engineers as defined in the Constitution.
iii) to promote the professional interests, rights, powers and privileges of Consulting Engineers.
iv) to give legislature, Public Bodies and others, facilities for conferring with and ascertaining the collective views of Consulting Engineers.
v) to confer with Associations representing Manufacturers, Contractors and other persons engaged in engineering works on matters of common interest.

Professional Engineers Board Singapore (PEB)

4.3 The Professional Engineers Board is a statutory body which administers the Professional Engineers Act (PE Act), which is an Act of Parliament that provides for the registration of professional engineers (PEs), regulates the qualifications and conduct of professional engineers and regulates corporations which supply professional engineering services in Singapore. PEB's mission is to safeguard life, property and welfare of the public by setting high standards for registering and regulating PE. Its main objective of the registration of PEs is to ensure that engineering works that involve public safety and interest are carried out by engineers who are competent.

4.4 The PE Act requires applicants for registration as PEs to possess an engineering degree of acceptable standard as well as an adequate and relevant post-graduate engineering experience. There are 12 engineering disciplines in the register of PEs maintained by PEB, namely Civil (including Structural), Mechanical, Electrical, Electronic, Aeronautical, Marine, Naval Architecture, Manufacturing (including Production), Industrial, Information Technology & Computer Engineering, Environmental and Chemical.

4.5 The regulatory authorities, especially those regulating engineering works in the building and construction industry, require plans of critical works to be certified by qualified persons. The authorities accept those who have been registered as PEs to be qualified persons for their purposes.

5 The Monitoring Committee

5.1 The IES shall be the assessing body for qualifications and experience required for placement on the APEC Engineers Register. IES has set up the APEC Engineer Monitoring Committee, Singapore (AEMCS) with the following Terms of Reference, to:

i) develop and maintain an assessment system to ensure that APEC Engineers meet the conditions of registration
ii) develop and maintain a Register of APEC Engineers in Singapore;
iii) audit continuing compliance by APEC Engineers with the conditions of registration;
iv) receive, investigate and resolve complaints against APEC Engineers; and
v) maintain and disseminate a list of persons whose APEC Engineer registration has been cancelled;
vi) participate in deliberations of the APEC Engineer Coordinating Committee;
vii) submit statements and such other information as may be required by the Coordinating Committee to enable the Coordinating Committee to review the proposed system;
viii) publish information on its assessment procedures, criteria, systems and performance;
ix) maintain records and documents in a form suitable for review by member economies;
x) provide representatives to assist in reviewing other assessment systems; and

xi) function as a single point of contact on all matters relating to APEC Engineers, including timely and accurate information on whether individuals are APEC Engineers.

5.2 The structure of AEMCS will include representatives engineering institutions in Singapore, namely from government, industry, relevant professional associations, and higher education institutions delivering engineering programs.

5.3 AEMCS comprises of 9 members, who are appointed from the following stakeholders:

i) Institution of Engineers Singapore (IES);
ii) Association of Consulting Engineers Singapore (ACES);
iii) Professional Engineers Board (PEB);
iv) National University of Singapore (NUS);
v) Nanyang Technological University (NTU); and
vi) a Secretary appointed by IES.

5.4 The names of members of AEMCS is in Annex 1.

5.5 The chairman of AEMCS shall be elected by its members.

5.6 The contact person for AEMCS is:

Secretary
APEC Engineer Monitoring Committee (Singapore)
c/o The Institution of Engineers, Singapore
70 Bukit Tinggi Road
Singapore 289758
Tel : (65) 64695000
Fax : (65) 64671108
Email : iesnet@singnet.com.sg

PART B:
ASSESSMENT MECHANISMS

6 Requirements for admission in APEC Engineer Register

6.1 AEMCS shall grant registration in APEC Engineer Register to a candidate if he/she:

i) is eligible for independent practice, being a professional engineer registered with the PEB and having in force a valid practising certificate;
ii) has completed an engineering program which is accredited or assessed to be substantially equivalent to a recognised engineering program;
iii) has obtained at least 7 years of practical experience since graduation;
iv) has spent at least 2 years in responsible charge of significant engineering work;
v) maintains continuing professional development in accordance with the requirements of the Professional Engineers Rules which is administered by PEB; and
vi) agrees to be bound by the Professional Engineers (Code of Professional Conduct and Ethics) Rules which is administered by PEB.

6.2 The candidate shall submit an application for registration in APEC Engineer Register which shall be in the format as described in Part D and in the engineering disciplines as prescribed in Part C.

7 Eligibility for Independent Practice

7.1 Assessment of eligibility for independent practice in Singapore is undertaken by the PEB. A candidate is assessed to be eligible for independent practice by virtue of his/her registration as a professional engineer with PEB and possession of a valid practising certificate issued by PEB.

7.2 It is a statutory requirement as provided in the Professional Engineers Act (PE Act) that no person shall engage in any professional engineering work in Singapore or sign and submit to a building authority any plan, sketch, drawing, design, specification or other document relating to any professional engineering work in Singapore, or any report on or a certificate or other document relating to any professional engineering work in Singapore which is required by any written law to be signed by a professional engineer, unless the person is a registered professional engineer.

8 Completion of an accredited engineering program or equivalent

8.1 Accredited engineering programs

A graduate is considered to have met the academic qualification requirement if he/she holds:

a) an engineering degree accredited by an organisation holding full membership and operating in accordance with the terms of the Washington Accord;

b) a Degree of Bachelor of Engineering from the National University of Singapore, the Nanyang Technological University or the University of Singapore[1], or an engineering program which has been accredited by Engineering Accreditation Board (EAB) of The Institution of Engineers, Singapore. The criteria and procedures for accreditation of engineering programs are provided in Attachment 2: Accreditation Manual of Engineering Accreditation Board, The Institution of Engineers Singapore; or

c) an engineering degree that is listed in Attachment 1: Professional Engineers (Approved Qualifications) Notification.

8.2 Alternative Assessment Mechanisms

An engineer who had not completed the accredited engineering programs listed above, but has other proper and recognised training in engineering and passes the Confirmatory Examination as prescribed by the PEB (refer to Attachment 4) is deemed to have satisfied the academic qualification requirement.

9 Attainment of at least 7 years of practical work experience

9.1 Candidates to be placed on the APEC Engineers Register shall have at least 7 years of relevant practical work experience after completing the accredited or recognised engineering program. Assessment of practical work experience shall be carried out through submission of a report describing the type, significance and level of responsibility of the engineering work experience. The report must demonstrate that the candidate has engaged in professional practice which, directly or indirectly, calls upon his engineering knowledge, skills, experience and judgment, and has a significant influence on the technical direction of engineering projects or programs. A professional interview will be conducted by PEB and/or AEMCS through the use of a panel of 3 senior professional engineers to review the practical work experience claimed and assess the competency. During the interview, the candidate must be prepared to answer questions on knowledge of engineering processes and management, understanding of investigation, planning, design, construction, manufacture, operation, maintenance and research, where relevant to his field of work experience, and PEB's Code of Professional Conduct and Ethics.

[1] Prior to formation of EAB, many of the engineering programs from the National University of Singapore, the Nanyang Technological University were accredited by constituent institutions of EC UK. The status of accreditation is in Attachment 5.

9.2 Acceptable engineering experience includes design or other practical engineering experience such as technical, economic and administrative factors as well as ability to express his ideas.

9.3 Currently, registration as professional engineer with PEB requires the following duration of practical work experience prior to registration:

i) more than 2 years of practical experience in engineering work at a professional level for a continuous period in Singapore (and has passed a professional practice examination prescribed by the Board);
ii) more than 5 years of practical experience in engineering work at a professional level, with at least 2 years to be in Singapore; or
iii) more than 10 years of practical experience in engineering work at professional level.

9.4 For candidates who have had at least 7 years of relevant practical work experience at the time when his/her practical work experience had been assessed by PEB, no further assessment by AEMCS will be necessary. However, if the number of years of relevant practical work experience at the time when his/her practical work experience had been assessed by PEB is less than 7 years, the remaining duration which is short of the 7 years shall be assessed by AEMCS through the submission of a report describing the type, significance and level of responsibility of the engineering work experience. A professional interview may be carried out if necessary.

10 Completion of at least 2 years in responsible charge of significant engineering work

10.1 A candidate should have spent at least 2 years in responsible charge of significant engineering work and this period could be within the course of the practical experience since graduation. Assessment will be carried out based on a report to be submitted by the candidate. Responsible charge of significant engineering work would be assessed as equivalent to any one of the following situations:

i) planned, designed and implemented a complete engineering project;
ii) undertaken a substantial part of engineering project while understanding the total project concept;
iii) undertaken a project that requires multi-disciplinary, complex or novel work responsibility.

11 Maintenance of Continuing Professional Development

11.1 PEB has implement a Continuing Professional Development (CPD) programme, the objectives of which are to reinforce the need for lifelong learning and to provide a framework through which professional engineers could systematically maintain and enhance competency to do a job in their area of expertise. All professional engineers who are registered with PEB and who wishes to obtain an annual practicing certificate are required to participate in the CPD programme. PEB's requirement for renewal of practising certificate is attainment of a minimum of 40 professional development units (PDUs) over a one-year renewal qualifying period.

Details of PEB's mandatory CPD programme for professional engineers is in Attachment 6.

12 Compliance with Code of Professional Conduct and Ethics

12.1 All professional engineers registered with PEB are bound by the Professional Engineers Act (Code of Professional Conduct and Ethics) Rules, a copy of which is in Attachment 7.

12.2 While professional engineers are required by the Professional Engineers (Code of Professional Conduct and Ethics) Rules to practice only in areas which they are competent in, a professional engineer on the APEC Engineer Register is required to sign a Declaration of Compliance that he/she shall only practice within the areas of his/her competence.

13 Audit of APEC Engineers

13.1 The audit provides for Declaration of Compliance by the registrant each year and provides for random audit (of between 2% and 5%) of current curriculum vitae and records of participation in CPD programme over the past two years.

PART C:
ENGINEERING DISCIPLINES

14 General requirement

14.1 AEMCS has resolved to support the registration of engineers in disciplines that correspond to general areas of practice by registered professional engineers in Singapore.

15 Engineering Disciplines

15.1 A professional engineer may be registered on APEC Engineer Register in any one of the following disciplines:

- CIVIL
- STRUCTURAL
- ELECTRICAL
- MECHANICAL
- GEOTECHNICAL
- ENVIRONMENTAL

15.2 A candidate can be registered in one or more disciplines, provided he/she meets the requirements in each and every one of the discipline he/she is to be registered in.

16 Area of Practice and Scope of Education Programs

16.1 Candidates shall satisfy the requirements in relation to each area of practice in which they apply to be registered on APEC Engineer Register.

16.2 **Civil Engineering**

Indicative area of practice

APEC Engineers in Civil Engineering discipline are concerned with materials such as steel, concrete, timber, earth and rock, and with their application in the research, design, development, manufacture, construction, operation, maintenance and management of hydraulic, structural, environmental and systems aspects of infrastructure works and services such as water, sewerage, transport, urban development and municipal services, and with building and construction for other infrastructure industries.

Indicative Scope of Education Programs

The following engineering topics are normally included in the education program and proficiency is expected in a minimum of 4 of the following areas:

- Structural Engineering
- Geotechnical Engineering
- Engineering Hydraulics
- Environmental Engineering
- Transportation Planning and Traffic Engineering
- Construction

16.3 Structural Engineering

Indicative area of practice

APEC Engineers in Structural Engineering discipline have expertise in research, planning, design, construction, inspection, monitoring, maintenance, rehabilitation and demolition of permanent and temporary structures and structural systems and their components and with associated technical, economic, environmental, aesthetic and social aspects. Structures might include buildings, bridges, in-ground structures, footings, frameworks and space frames, including those for motor vehicles, space vehicles, ships, aeroplanes and cranes, composed of any structural material including composites and novel materials.

Indicative Scope of Education Programs

The following engineering topics are normally included in the education programme and proficiency is expected in a minimum of 4 areas.

- Structural materials and mechanics
- Structural analysis
- Structural design
- Foundation Engineering
- Wind and earthquake engineering
- Engineering surveying
- Soil and rock mechanics
- Engineering geology
- Construction

16.4 **Electrical Engineering**

Indicative area of practice

APEC Engineers in Electrical Engineering discipline are concerned with research, design, development, manufacture, installation, operation, maintenance and management of equipment, plant and systems within the electrical, electronic, communication and computer systems areas. Electrical Engineering is applied to electrical power generation, transmission, distribution and utilisation, manufacture, instrumentation and control in industry, communications networks, electronic plant and equipment, integration and control of computer systems.

Indicative Scope of Education Programs

The following engineering topics are normally included in the education programme and proficiency is expected in a minimum of 4 areas.

- Electronic devices and Network Theory
- Electromagnetic and Electrical Fields
- Analogue and Digital Electronics
- Control System
- Communications Systems
- Energy Conversion
- Power and Machines
- Power Engineering

16.5 **Mechanical Engineering**

Indicative area of practice

APEC Engineers in Mechanical Engineering discipline are concerned with research, design, development, evaluation, manufacture, installation, testing, operation, maintenance and management of machines, machine and thermodynamic processes, and manufacturing and materials handling plants and systems. Mechanical Engineering is applied to manufacturing, transport, electricity generation, and in works and services using machine systems, including the environment of building interiors. Applicants must have experience in the safety aspects of design and/or operation of machines, plant, systems or processes.

Indicative Scope of Education Programs

Education programs normally include the fundamentals engineering science, mathematical and computational techniques, principles of instrumentation and control to the design development, analysis and performance prediction of a wide range of mechanical engineering equipment and systems.

The following engineering topics are normally included in the education programme and proficiency is expected in a minimum of 4 areas.

- Thermodynamics
- Heat and mass transfer
- Fluid mechanics
- Mechanics of machines
- Thermal and electro-mechanical systems
- Materials technology
- Product and engineering design
- Manufacturing Systems and Technology
- Computer aided engineering
- Automation and control systems

16.6 **Geotechnical engineering**

Indicative area of practice

APEC Engineers in Geotechnical Engineering discipline are concerned with the planning, investigation, design, construction and maintenance of works involving the ground, and works constructed from excavated natural materials.

Indicative Scope of Education Programs

The following engineering topics are normally included in the education programme and proficiency is expected in a minimum of 4 areas.

- Engineering Geomorphology
- Engineering Geology
- Hydrogeology
- Geo-environmental Engineering
- Geophysics
- Soil Mechanics
- Rock Mechanics
- Foundation Engineering
- Engineering Seismology and Ground Treatment
- Structural Engineering

16.7 **Environmental Engineering**

Indicative area of practice

APEC Engineers in Environmental Engineering discipline is concerned with the engineering for the protection of the environment. It requires fundamental understanding of environmental science and an appreciation of the mechanics of environmental systems to enable study, investigation, design, management & control of such systems.

Collectively and holistically, they apply an integrated approach to technical, economic, social, legal and scientific considerations. Environmental Engineers work on new or existing projects that require some form of improvement, remediation or rehabilitation in the natural and built environment. Environmental Engineers work in many areas of environmental protection including water quality, waste water and storm water management, solid and hazardous waste management, contaminated land remediation, natural resource management, air quality, noise management, greenhouse gas emission reduction, environmental management systems, environmental information systems, social impact analysis and environmental risk assessment.

Indicative Scope of Education Programs

The following engineering topics are normally included in the education programme and proficiency is expected in a minimum of 4 areas.

- Water and wastewater management and treatment
- Sludge management and treatment
- Environmental chemistry and microbiology
- Ground Water Hydraulics and Hydrology
- Fluid mechanics & Heat Transfer
- Soil Physics and Contaminated Land
- Solid waste and hazardous waste management and disposal systems
- Environmental Assessment and Management System
- Sustainable System
- Structural Engineering
- Mechanical Engineering in Thermal and air movement
- Daylight and Visual comfort

PART D:
ASSESSMENT DOCUMENTATION AND REPORT

17 Guide for Candidates

17.1 General

This guide describes the application procedure when a professional engineer registered with the PEB wishes to be registered on APEC Engineer Register. This guide also applies to renewal of registration.

17.2 Frequency of Assessment and Effective Term of Registration

- Assessment is to be carried out as and when necessary.
- Effective term of registration shall be five years from the date of registration.

17.3 Procedure for Assessment

- Application for the registration on APEC Engineer Register shall be made to AEECS using the prescribed application form in Attachment 8. Documents to be submitted, assessment fee, initial registration fee, and renewal fee are listed in the application form.
- AEMCS will review and assess the application. An interview will be conducted if required.
- Candidates will be informed of the outcome of the assessment by AEMCS in writing.

17.4 Assessment Methods

There will be 2 phases of assessments before a candidate is successfully registered on the APEC Engineer Register, as follows:

(a) Assessment by PEB for registration as a professional engineer

As one of the requirements for registration on APEC Engineer Register is eligibility for independent practice as a professional engineer registered with PEB, a candidate would have been assessed by PEB for registration as a professional engineer in the following manner:

- academic qualification had met the requirements stipulated in the Professional Engineers Act;
- report of practical work experience had been reviewed through a professional interview by an Interview Panel comprising 3 senior registered professional engineers.

Details of the requirements which are assessed by PEB are in Attachment 8.

(b) Assessment by AEMCS

AEMCS will appoint Assessment Panels each comprising a Lead Assessor and 2 Assessors who are senior and experienced registered professional engineers in the appropriate discipline to review and assess applications for registration on APEC Engineer Register. The assessment by Assessment Panels may include an interview with the candidate. The Assessment Panels will make recommendations to AEMCS on whether a candidate should be place on APEC Engineer Register.

17.5 **Assessment Panels**

AEMCS will appoint Assessors based on the following criteria:

- registered professional engineers practising in the same field of engineering an the candidates to be assessed; and
- possess more than 10 years of practical experience after obtaining registration as a professional engineer.

The assessment will be divided into two stages. The Assessment Panel will consider the primary assessment already conducted by PEB when the candidate applied for and obtained registration as a professional engineer. The Assessment Panel will review whether the requirements in 6.1 have been satisfactorily assessed by PEB in the primary assessment, and if not, secondary assessment will be carried out by the Assessment panel. An interview may be conducted by the Assessment Panel if necessary.

17.6 **Assessment Report and Decision**

Assessment Panels will prepare and submit its recommendations to the Monitoring Committee together with all application documents that were subjected to assessment. The Monitoring Committee will review and confirms that the procedures for assessment is adequate and there are no discrepancy and inadequacy.

The Monitoring Committee approves the registration of each successful candidate presented in the Summary List by positive vote of more than half of the committee members presented.

17.7 **Notice of the Results**

AEMCS will inform all candidates of the results of its assessment, including providing reasons for failure where applicable.

17.8 **Availability of Assessment Report**

AEMCS will provide information on its assessment of professional engineers who are registered on the APEC Engineers Register when requested by members of APEC Engineers Monitoring Committees.

ANNEX 1: NAMES OF MEMBERS OF APEC ENGINEER MONITORING COMMITTEE, SINGAPORE

AEMCS comprises the following members:

Chairman:

Er. Tan Seng Chuan
President, Institution of Engineers Singapore
Board Member, Professional Engineers Board

Members:

Er. Prof Chew Yong Tian
Council Member, Institution of Engineers Singapore

Er. Chong Kee Sen
Council Member, Institution of Engineers Singapore

Er. Lee Chuan Seng
Board Member, Professional Engineers Board

Er. Ong See Ho
Board Member, Professional Engineers Board

Er. Ling Shiang Yun
Council Member, Association of Consulting Engineers Singapore

Er. Peter Lee Chung Shek
Member, Association of Consulting Engineers Singapore

Er. Prof Er Meng Hwa
Acting Provost, Nanyang Technological University

Secretary and Contact Person:

Er. Cheah Kee Han
Council Member, Institution of Engineers Singapore
The Institution of Engineers, Singapore
70 Bukit Tinggi Road
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Tel : (65) 64695000
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Email : iesnet@singnet.com.sg