GUIDELINES FOR APPLICATION FOR REGISTRATION AS SPECIALIST PROFESSIONAL ENGINEER IN TUNNELLING ENGINEERING

Introduction

1. A PE in civil engineering may apply to be registered as a specialist professional engineer in tunnelling engineering if he has a valid practicing certificate and meets one of the following sets of conditions as specified in the Fourth Schedule of the PE Rules 1991 as follows:

Set (A)

(i) the applicant has not less than 5 years (in aggregate) of such experience in tunnelling design and construction, with at least one year in each component (whether in Singapore or elsewhere), as may be acceptable to the Board, of which at least 3 years of that experience was obtained whilst practising as a registered professional engineer in Singapore;

(ii) the applicant —

(A) has a post-graduate engineering degree (such as M.Sc or PhD) majoring in tunnel engineering or mining engineering from a university set out in the Schedule to the Professional Engineers (Approved Qualifications) Notification 2009 or such other qualifications as may be acceptable to the Board; or

(B) has a post-graduate engineering degree (such as M.Sc or PhD) majoring in geotechnical engineering from a university set out in the Schedule to the Professional Engineers (Approved Qualifications) Notification 2009 or such other qualifications as may be acceptable to the Board, and has passed an examination on tunnel engineering specified by the Board; and

(iii) the applicant has passed a specialist registration examination on tunnel engineering conducted by the Board;

Set (B)

(i) the applicant has not less than 8 years (in aggregate) of such experience in tunnelling design and construction, with at least one year in each component (whether in Singapore or elsewhere), as may be acceptable to the Board, of which at least 3 years of that experience was obtained whilst practising as a registered professional engineer in Singapore;

(ii) the applicant has successfully completed a training course in tunnel engineering as specified by the Board; and

(iii) the applicant has passed a specialist registration examination on tunnel engineering conducted by the Board;

Examination

2. One of the requirements as mentioned in para 1 above is that a Set (A) or Set (B) applicant must sit for and pass a specialist registration examination on tunnel engineering conducted by the Board. The specialist registration examination on tunnel engineering conducted by the Board is an oral examination and will be conducted together with the professional interview for registration as specialist PE in tunnelling engineering in a single session. The syllabus for the examination is as specified in Annex A below.

Report

3. An application must be accompanied by a Summary of Postgraduate Professional Experience and a Report on Postgraduate Engineering Experience describe in particular the design and construction in tunnel engineering experience that the applicant has acquired.

it should include the tasks that the applicant has been involved in, the levels of his responsibilities, the identification of special engineering problems encountered and the demonstration of the use of engineering knowledge, experience and judgment to resolve them etc. The Report shall be about 2,000 words and must not be a mere inventory of work done.

4. The Summary of Postgraduate Professional Experience and Report on Postgraduate Engineering Experience must be verified by registered Professional Engineer in Singapore, accompanied by the professional engineer's stamp. The Report on Postgraduate Engineering Experience must also be signed by the applicant himself or herself.

Interview

5. The Board would require all Set (A) and Set (B) applicants to undergo an interview. The interview would cover the following:

   a) to determine the type and duration of practical experience in tunnel engineering;

   b) to assess the basic understanding, and scope and depth of the applicant's practical experience in tunnel engineering, in particular, to establish the level of responsibility – i.e. whether the applicant's nature of work is at subordinate level or at the level of making technical decisions and to establish whether his experience is sufficient to enable him to act and take technical decisions independently.

6. In general, an applicant would be assessed based on his practical experience as illustrated in his report. These should cover various major tunnel engineering areas, such as:

   a) Local engineering geology and geotechnical engineering, and its application in tunnelling. (Core area)
   b) Design and construction of bored tunnelling works (more than 6m in size) and/or complex mining works. (Core area)
   c) Tunnelling instrumentation monitoring and interpretation including tunnelling Key Performance Indicators and other related engineering parameters. (Core area)
   d) Impact assessment of adjacent buildings, structures and underground utilities. (Core area)
   e) Ground improvement for bored and mined tunnelling works
   f) Construction safety, fire safety, ventilation and environmental control during tunnelling
   g) Working in compressed air and related regulations

7. The applicant could be queried on his involvement in one or more phases of a project such as planning, design & analysis, construction, and operation & maintenance in relation to the tunneling aspects.

8. An applicant is required to demonstrate that he/she has substantial practical experience and knowledge as to be competent in the four major core tunnelling areas mentioned above. Where applicable, consideration could be given to his competence in the other tunnelling areas. In addition, the conduct, attitude and professionalism that the applicant displays during the interview would also be considered.

9. When registering a professional engineer in the specialised branch of tunnelling engineering, the Board may impose such conditions as it thinks fit.

Fees

10. The fees for an application by a Set (A) or Set (B) applicant to sit for the specialist registration examination in the branch of tunnel engineering is $450. The fees for an application by a Set (A) or Set (B) applicant to register as a specialist professional engineer in tunnelling engineering is $300.

Application

11. Applicant may login to PEB website > Login to PEB Portal (E-Services) to submit your application. For more information on registration as a Specialist Professional Engineer, an applicant may refer to "User Guide to Apply for Specialist Professional Engineer (SPE) Registration" available in PEB's Website > Resources. All documents are to be uploaded into the PEB Portal.

Annex A

SYLLABUS FOR SPECIALIST REGISTRATION EXAMINATION IN TUNNEL ENGINEERING

Legislations and Guidelines Related to Tunnel Engineering

1. Building Control Act
2. Workplace Safety and Health Act
3. Workplace Safety and Health (General Provisions) Regulations
4. Workplace Safety and Health (Risk Management) Regulations

Codes and Standards Related to Tunnel Engineering

The applicant shall have an in-depth understanding of the relevant local and international codes and standards including but not limited to the following:

1. BS 6164: Code of Practice for Health and Safety in Tunnelling in the Construction Industry
2. BS EN 16191: Tunnelling Machinery - Safety Requirements
3. BS EN 12110: Tunnelling Machines – Air Locks – Safety requirements
4. BS EN 1889-2: Machines for underground mines, Mobile machines working Underground, Safety, Rail locomotives

Other Relevant Areas in Tunnel Engineering

1. Other than possessing knowledge in the relevant prevailing codes and standards above, candidates applying to be a specialist professional engineer in tunnelling engineering are required to possess knowledge in the fundamental principles of the following aspects of tunnel engineering:

    a) Local engineering geology and geotechnical engineering and its application in tunnelling.

    b) Design and construction of bored tunnelling works (more than 6m in size) and/or complex mining works.

    c) Tunnelling instrumentation monitoring and interpretation including tunnelling Key Performance Indicators and other related engineering parameters.

    d) Impact assessment of adjacent buildings, structures and underground utilities.

Local Engineering Geology and Geotechnical Engineering

The applicant shall be knowledgeable in the following areas:

1. Fundamentals of geology and its application in tunnelling
2. Rock and soil mechanics and its application in tunnelling
3. Rock mass classification and its application in tunnelling
4. Site investigation and ground characterization and its application in tunnelling

Design and Construction of Bored Tunnelling Works

The applicant shall be knowledgeable in the following areas:

1. Segmental lining design
2. Face pressure calculation
3. Excavation methods: mechanised tunnelling
4. Understanding of Tunnel Boring Machines (TBM)
5. Logistic and supply chain for mechanised tunnelling
6. Rings selection, quality of segments, casting, erection, handling tight radius
7. Construction safety, fire safety, ventilation and environmental control during tunnelling
8. Interpretation of Tunnel Boring Machine (TBM) parameters during construction
9. Working in compressed air and related regulations
10. Ground Improvement for bored tunnelling works
11. Theory and application of Excavation Management System for slurry and EPB TBM
12. Slurry Treatment Plant (STP) design of separation capacity
13. Slurry function, slurry properties and testing, slurry quality control for Slurry TBM
14. Soil Conditioning for EPB TBM

Design and Construction of Complex Mining Works

The applicant shall be knowledgeable in the following areas:

1. Sprayed concrete lining design
2. Cast in situ permanent Lining design
3. Review of mined tunnels design using numerical methods
4. Excavation methods: conventional tunnelling
5. Cavern design and construction, drill and blast

6. Ground Improvement for mining works

Tunnelling Instrumentation Monitoring and Interpretation Including Tunnelling Key Performance Indicators and Other Related Engineering Parameters

The applicant shall be knowledgeable in the following areas:

1. Understanding of Instrumentation & Monitoring for mechanised and conventional tunnelling, example:
    a) Common types of instruments and how they work
    b) Definition of influence zone
    c) Ground settlement
    d) Subsurface monitoring
    e) Utilities monitoring
    f) Building / Infrastructure monitoring
2. Understanding special monitoring scenario, example:
    a) Adjacent tunnels
    b) Monitoring during TBM launching, including thrust frame monitoring
    c) Monitoring during cutter head intervention
    d) Monitoring for mined tunnels construction
3. Understanding tunnelling Key Performance Indicators (KPI) and other related engineering parameters

Impact Assessment of Adjacent Buildings, Structures and Underground Utilities

The applicant shall be knowledgeable in the following areas:

1. Estimation of ground settlements; estimation of adjacent structure movements
2. Building/structure types and methodologies to assess impact to adjacent buildings/structures
3. Establishing allowable buildings/structures limits
4. Groundwater control measures (dewatering and recharging) and other mitigation and contingency measures