MHKIE(G) – why, what, how?

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HKIE

Geotechnical Discipline Advisory Panel (GDAP)
(qualification and membership)

Geotechnical Division Committee (GDC)
(learned society activites)

- Qualification and Membership Board
- Registration Committee
- Professional Assessment Committee
- Quality Control Committee
- Education and Examination Committee
- Training Committee
- Appoint and manage MHKIE(G) Assessors
- Experts for accreditation of university engineering degrees

Geotechnical Discipline Advisory Panel 2020-21

Chairman (Discipline Reprehensive)	**Ir Prof Ken Ho**
Deputy Chairman (Deputy Discipline Representative)	**Ir Dr CK Lau**
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	Ir Dr Daman Lee
	Ir Chris Lee
	Ir Prof George Tham
	Ir Dr KC Wong
Observer	**Ir Maureen Ng**

Why bother with MHKIE(G)?

Nature of geotechnical engineering work

- Many uncertainties and hazards, risky business
- Limitations in technical know-how and engineering judgement
- Failure of geotechnical structures could have dire consequences to public safety
- A professional without geotechnical specialization and the requisite expertise and experience may not be able to properly discharge his professional duties relating to geotechnical works
- Require input by competent geotechnical specialists to exercise relevant skills, expertise and judgement to manage geotechnical risk and enhance the quality of geotechnical works

Projects requiring specialist geotechnical input

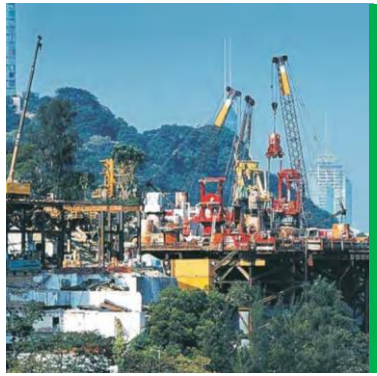
Excavation & Lateral Support Works

Tunneling works (e.g. Tunnels, caverns, shafts)

Site Formation Work (e.g. slope stabilization, retaining structures)

Ground Improvement

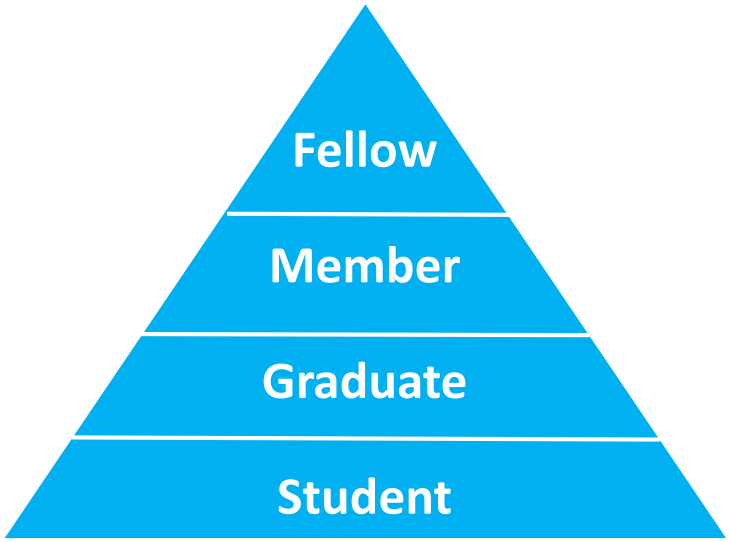
Natural Terrain Landslide Hazard Study and Mitigation



Foundations (e.g. in Scheduled Areas, or affecting running tunnels)

A recognized specialist professional qualification to assure technical competence

MHKIE(G)



Use of the prefix “Ir” in your nam

The right to vote on matters relating to the governance of the Institution

Route to RGE and RPE (G)

Register of Geotechnical Specialists ('Gold' Standard)

- Eligibility of Registration of **Registered Professional Engineer (Geotechnical) (RPE(G))** under Engineers Registration Ordinance:
    1. hold a professional qualification acceptable for registration for one year (e.g. MHKIE (G));
    2. practice in Hong Kong for one year after acquiring professional qualification in (1) above; and
    3. ordinary resident in Hong Kong.

- Eligibility of Registration as **Registered Geotechnical Engineer (RGE)** under Section 3(7) of the Buildings Ordinance:
    1. obtained the prescribed qualifications (i.e. RPE(G), and prescribed experience stipulated in Building (Administration) Regulation);
    2. recommended by the Geotechnical Engineers Registration Committee (RC) for inclusion.

What procedures and routes?

What is MHKIE(G)?

A Corporate Member of HKIE in the Geotechnical Discipline, MHKIE(G), is ……

a qualified professional engineer who has:

- attained the age of 25,
- obtained an accredited/recognized degree in a relevant engineering discipline,
- received adequate training,
- had sufficient responsible experience, and
- successfully completed the Professional Assessment or the equivalent.

He/she is recognized as being professionally competent and technically proficient in geotechnical field

General Requirements

Academic

- First deg. (Hon.) accredited by HKIE or listed in the Washington Accord
- Others require individual assessment (e.g. Earth Science degree)

CPD

General
- minimum average of 45 hr/year

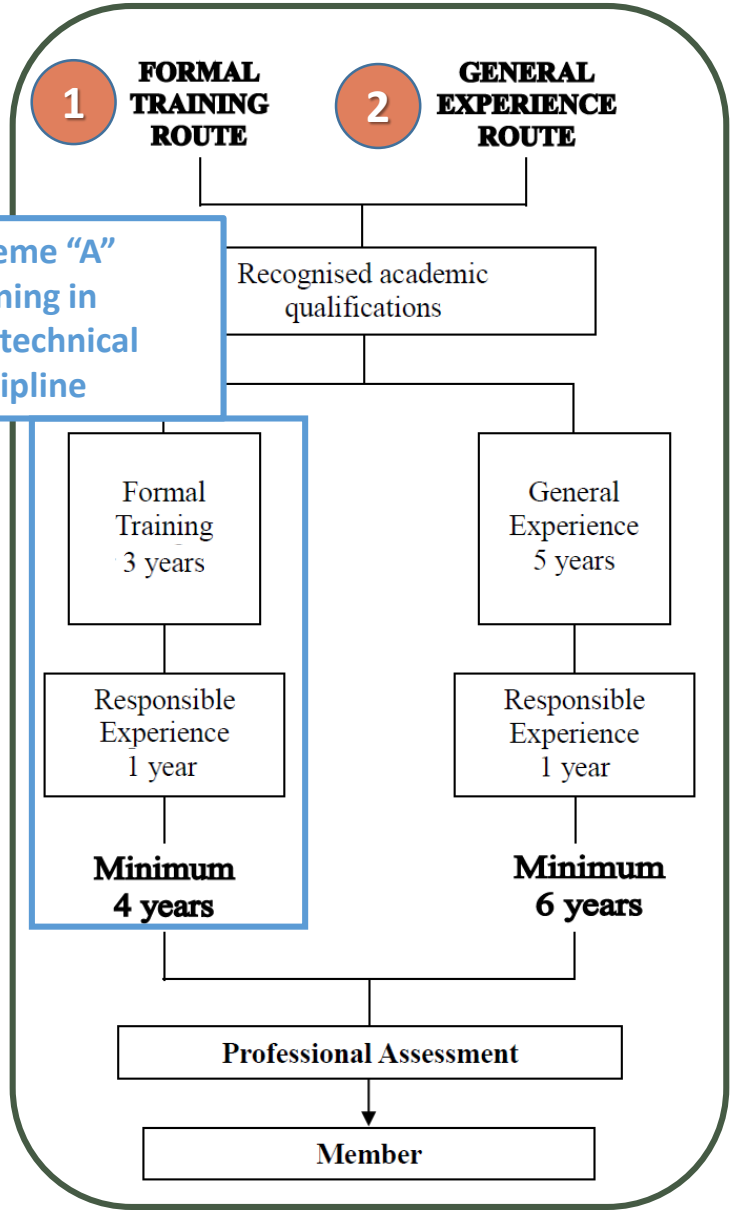
Specific
- vary subject to the routes taken

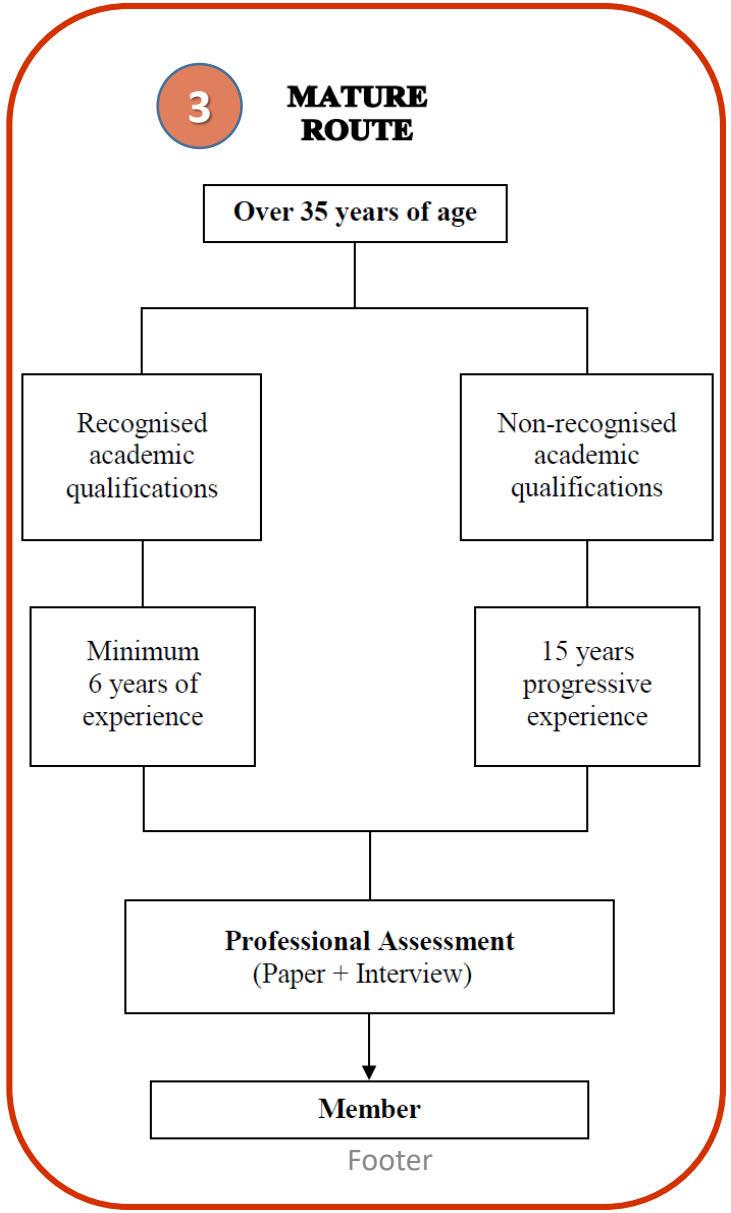
Training and Experience

- 3-year Scheme "A" Training
  or + 1-year responsible experience
- 5-year General Experience

Geotechnical Discipline
- 12-month full time site experience in the role of (assistant) geotechnical engineer
- at least 6-month full-time continuously on site, but < 4 months on supervision of GI
- contract document preparation and contract administration experience

Routes to MHKIE(G) Professional Qualification





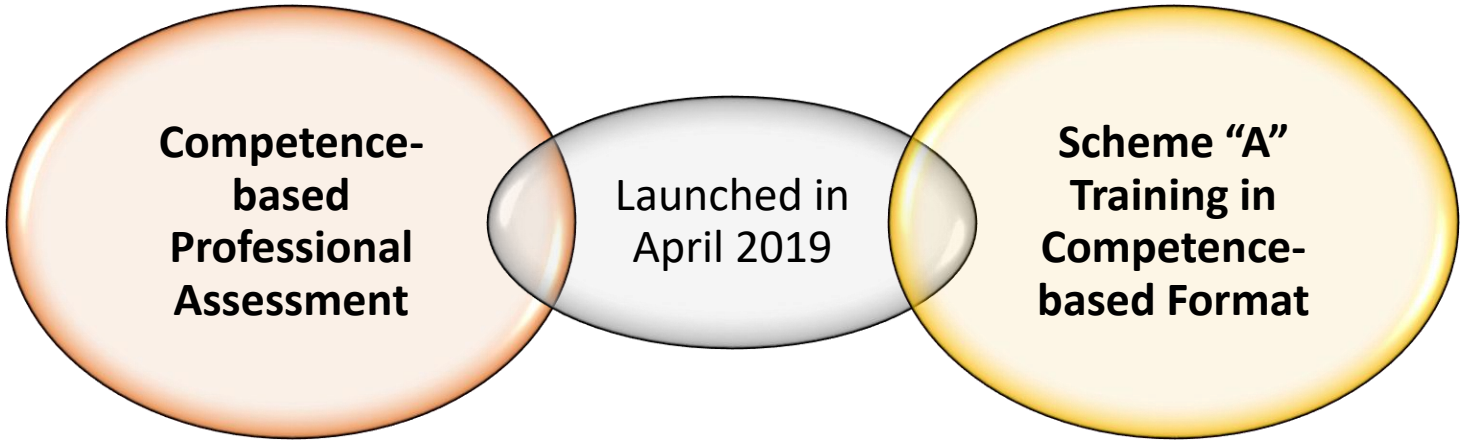
4 **Additional discipline candidates, who are MHKIE(Civil)**

5 **Candidates who are members of the following institutions which have Reciprocal Recognition Agreement (RRA) with HKIE:**

- **ICE**
- **IMMM (chartered engineers)**
- **IEAust**

Note : Also R&D route and EG route

HKIE Competence Standard for Professional Engineers



- A **Competence Standard** is an indication of an expected level of performance. It consists of:

  Competences: represent broad areas of professional engineering competence and set the standard expected for professional recognition as MHKIE.

  Performance Indicators (or attributes): elaborate the meaning of each competence thereby enabling the applicants and assessors to have a clear understanding of the abilities required to demonstrate each competence

  ** they are neither minimum requirements nor exhaustive elaboration*

12 Competences under Four Areas Defined by HKIE + written communication skills

Applying Engineering Knowledge

- C1: Comprehend and apply knowledge of accepted principles underpinning widely applied good practice for professional engineering
- C2: Comprehend and apply knowledge of accepted principles underpinning good practice for professional engineering that is specific to Hong Kong
- C11: Maintain the currency of his or her professional engineering knowledge and skills

Developing Technical Solutions

- C3: Define, investigate and analyse complex engineering problems in accordance with good practice for professional engineering
- C4: Design or develop solutions to complex engineering problems in accordance with good practice for professional engineering

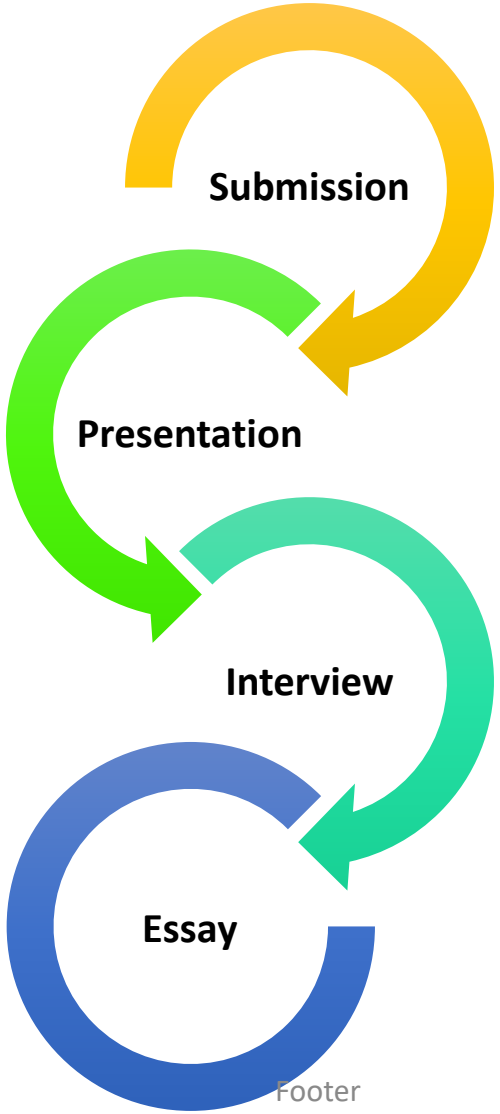
Managing Engineering Work

- C5: Be responsible for making decisions on part or all of one or more complex engineering activities
- C6: Manage part or all of one or more complex engineering activities in accordance with good engineering management practice
- C7: Identify, assess and manage engineering risk
- C12: Exercise sound professional engineering judgement

Upkeeping Professional Acumen

- C8: Conduct engineering activities to an ethical standard prescribed by the HKIE
- C9: Recognise the reasonably foreseeable social, cultural, health, safety, sustainability and environmental effects of professional engineering activities generally
- C10: Communicate clearly with other engineers and others that he or she is likely to deal with in the course of his or her professional engineering activities

Professional Assessment Process



Submission Requirements

- **Formal Training Route**
- **General Experience Route**

1. Training & Experience Report

- 1600-2000 words
- describe the tasks, positions occupied and the degree of responsibility (in chronological order)
- state the size & cost of works
- elaborate on problems and solutions
- provide evidence for achieving all the required competences

2. Project Report

- 4000 words
- describe a project or parts of it with major responsibility
- demonstrate technical & professional competence in geotechnical field
- report the interpretation of desk study, GI, site monitoring; describe the problems, assumptions, assessments, design calculations, etc.

3. Technical Proposal & Cost Estimate

- or specification and BOQ, including taking-off (or rough working) sheets
- preferably for a significant investigation / laboratory testing programme, or a geotechnically related aspect of a project

4. A report on site work in the role of geotechnical engineer (1000 words)

5. Logbook (Scheme "A")

6. CPD Record

Submission Requirements

- via Additional Discipline with MHKIE(Civil)
- via RRA route

1. Training & Experience Report

- 1600-2000 words
- describe the tasks, positions occupied and the degree of responsibility (in chronological order)
- state the size & cost of works
- elaborate on problems and solutions
- provide evidences for achieving the Competences

2. Project Report

- 4000 words
- describe a project or parts of it with major responsibility
- demonstrate technical & professional competence in geotechnical field
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Interview

Project Presentation

- 15-min presentation on Project Report
- Objective is to ensure the candidates are able to present themselves orally

Interview

- to prove that candidates have spent sufficient time on suitable work and self-reflection on the training/work experience
- to ascertain how far the candidates have taken advantage of the opportunities provided during their training and experience
- to ensure that all the Competences are achieved

Essay

- **A choice of two topics relating to the candidate's experience, or broader issues relating to the engineer in community.**
- **2 hours in duration; c. 1,600 words (less than 1,000 words is unlikely to pass)**

- To assess **written communication skills** i.e. ability to communicate effectively with others in the course of engineering activities

  Generic English communication skills: clarity of argument, logical presentation and accuracy; able to write concise and grammatically correct English with proper presentation relevant to the intended readers.

  Technical communication skills: candidate's knowledge and the relevance of the ideas expressed; able to demonstrate a reasonable depth and breadth of knowledge in the subject area.

Notes on Professional Assessment for MHKIE(G) –

Basic Geotechnical Engineering Knowledge Requirements

Candidates are expected to be conversant with basic principles and general knowledge related to geotechnical engineering as illustrated in Table 1. It must be stressed that the subjects listed should not be taken as exhaustive. Candidates should be able to explain geotechnical phenomena in terms of basic geotechnical engineering principles and how to apply theory to practice.

Candidates are expected to possess, in addition to basic geotechnical engineering knowledge, good professional knowledge and experience in the geotechnical area that they have worked on. A broad appreciation of other geotechnical areas would also be required. It is most important that candidates should demonstrate that they exercise original thought and judgment and not blindly work to rules. They should know the basic assumptions behind design methods and software and should be able to give technical explanations on the difference between design and actual performance of the geotechnical works.

Candidates should be able to express ideas in a well-organized, accurate and concise manner and to present technical arguments/explanations logically. They should demonstrate up-to-date knowledge of the latest development in geotechnical engineering.

Table 1 – Basic Geotechnical Engineering Knowledge Requirements

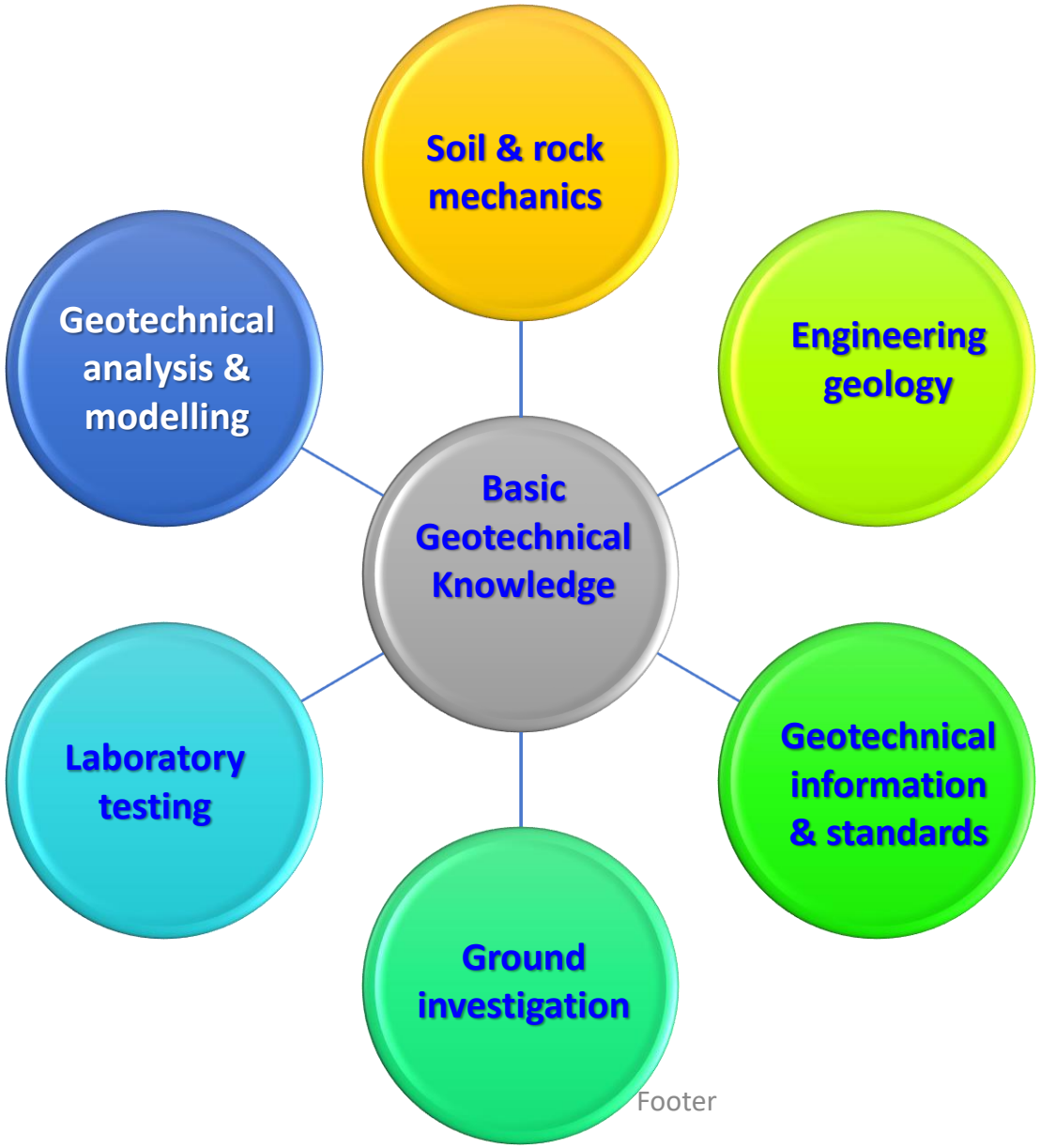
Area	Subject
Soil and rock mechanics	● Principles of effective stress ● Stress analysis, Mohr circles of stress and strain, stress paths ● Soil behaviour in shear, compression and effect of groundwater pressure (seepage and consolidation) ● Groundwater flow, permeability and seepage ● Shear characteristics of discontinuities in rocks ● Measurement and presentation of characteristics of discontinuities in rocks
Engineering geology	● Geological process and implications ● Engineering geology of Hong Kong rocks and soils ● Model approach and engineering geological input into geotechnical engineering applications
Geotechnical information and standards	● Source of geotechnical information ● Knowledge of geotechnical standards in Hong Kong
Ground investigation	● Scope of desk study and sources of information ● Planning and objectives of ground investigation ● Soil and rock descriptions ● Subsurface investigation and sampling techniques (trial excavation, drilling, coring and geophysics) ● Field tests and measurements ● Rock joint surveys and mapping ● Geotechnical instrumentation – groundwater, movements, strain and vibration measurements
Laboratory testing	● Soil classification and index properties ● Shear testing and soil behaviour – common types of testing methods (triaxial and shear box tests), measurements and analysis ● Consolidation testing
Geotechnical analysis and modelling	● Calculation of settlement – application of elasticity and consolidation theory ● Methods of limit equilibrium – limiting earth pressures, limiting bearing capacity, infinite slope, method of slices and wedge analysis ● Steady state and transient seepage flows – flow nets, finite difference and finite element methods ● Physical and numerical modelling – theory and assumptions used

Prepared by Geotechnical Discipline Advisory Panel
October 2012

Basic geotechnical knowledge requirements

Prepared by GDAP in 2012

Basic Geotechnical Knowledge Requirements



Basic Geotechnical Knowledge Requirements (1/2)

- Candidates are expected to be **conversant with basic principles** and general knowledge related to geotechnical engineering in Table 1 ….. able to explain ……. **how to apply theory to practice**

- Candidates are expected to possess …. good professional knowledge and experience in the geotechnical area that they have worked on. A broad **appreciation of other geotechnical areas** would also be required

Basic Geotechnical Knowledge Requirements (2/2)

- Candidates should demonstrate that they can exercise **original thought and judgement** and do not blindly work to rules

- They should know the **basic assumptions** behind **design methods and software**

- Candidates should be able to express ideas in a well-organized, accurate and concise manner and present technical arguments or explanations logically. They should demonstrate **up-to-date knowledge** of the **latest development** in geotechnical engineering

How to be successful in Professional Assessment?

Selected questions which some candidates struggled with during my interviews

Some Example Questions (1 of 4)

- A figure showing just a long slope and a piezometer – candidate asked to indicate the piezometric level *[making reasonable assumptions, knowledge of flow net for steady state seepage, meaning of equipotential lines, etc.]*
- To derive an expression for initiation of hydraulic (base) failure due to seepage pressure caused by upward water flow
- Principles and application of Mohr circles
- Mechanism of static liquefaction of loose fill slopes in terms of stress path
- Pile design including concepts of relaxation and set-up, dynamic testing, etc.
- Site investigation and foundation design in marble sites
- Quality control of soil nails, soil compaction, use of bentonite, etc.
- Key lessons learnt from major landslides
- Geotechnical problems and special geotechnical control in Scheduled Areas and Designated Area

Some Example Questions (2 of 4)

- Partial safety factor approach of CIRIA Report C580 for ELS design
- Rock mechanics principles and stress concentration for tunnel design
- Assessment of adverse effect of TBM operations & mitigation measures
- Investigation and assessment procedures for loose fill slopes
- Stress paths for different types of loading and materials
- Stereonets for different rock failures, including unstable rock wedges falling from tunnel roof under gravity and sliding mode
- Concept and application of arching effects in geotechnics
- Determination of face support pressure for TBM operation

Some Example Questions (3 of 4)

- Typical shear strength of weak joint infill with different mineralogy
- Identification of common rock types and engineering properties of special rock types (e.g. eutaxite, andesite, mozonite and syenite)
- Design of piles for negative skin friction under different scenarios
- Saturation, consolidation and shearing of samples in triaxial tests
- Design principles of slope drainage, including U-channels and stepped channels
- Assumptions and limitations of different slope stability analyses
- Design concept of soil nails in loose fill
- Application of consolidation theory to reclamations and design principles of different ground improvement techniques

Some Example Questions (4 of 4)

- Basic soft clay behavior under shear, consolidation & creep, and typical values of key parameters of marine mud in Hong Kong
- Corrosion protection of soil nails in non-aggressive and aggressive ground
- Theory and test procedures of use of Time Domain Reflectometry (TDR) in soil nails
- Approaches to Natural Terrain Hazard Study
- Design approaches for natural terrain mitigation measures
- Calculation of overall system stiffness of struts (in parallel and in series) for input into computer model for ELS works
- Assessment of hoop stress in a circular excavation


CEDD
Civil Engineering and Development Department
Day Camp for
Engineers of Tomorrow

Some Salient Observations

- Some candidates were rather young with limited exposure and rather narrow and superficial experience; others may have worked principally within one unit doing repetitive work on a part of the problem, without an overview of the totality of the problems

- Some were unable to make clear simple sketches approximately to scale to explain the projects or communicate ideas

- There is a tendency to just show the geological profile (and only do so when prompted), but not the groundwater regimes – lacking geotechnical sense

Examples of Deficiencies in Unsuccessful Cases (1/2)

- Shaky foundation in basic knowledge and lack of proper understanding of fundamental principles *[undergraduate education does matter]*
- Inadequate professional exposure *[experience not solid enough and sometimes too narrow]*
- May know ‘what’, how’, ‘where’, ‘when’, but not so well ‘why’, ‘what if’

Examples of Deficiencies in Unsuccessful Cases (2/2)

- Tendency to favour rote learning *[good at memorizing answers for certain questions and following rules rigidly, but without understanding the limits of applicability]*

- Lacking a good engineering sense, and the capability or confidence to make sound engineering judgement

- Not too keen to read papers or reports *[“what papers”, “Where do I start”, “I don’t have the time”, ‘why is that necessary”?]*

Other Shortfalls Noted by a GDAP Member (1/3)

- Report/presentation materials not the candidate's own work
- Not well prepared for the interview, even for resits
- Do not fully understand what the assessors are asking
- Unable to demonstrate adequate understanding of the subjects
- Lack confidence due to nervousness
- Poor understanding of the risks associated with different geotechnical works

Other Shortfalls Noted by a GDAP member (2/3)

- Planning and organisation of engineering tasks and resources is unsatisfactory
- Unable to demonstrate good understanding of budget preparation and controls
- Poor appreciation of sustainability principles
- Superficial knowledge of statutory and commercial frameworks
- Inadequate understanding of site safety legislations, hazards and safe system of work
- Lack of participation in learned society events, including those of GDC

Other Shortfalls Noted by a GDAP member (3/3)

- Unable to demonstrate understanding of soil mechanics principles and theories, e.g. slope stability analysis and soil compaction
- Cannot distinguish between dilation/compression behaviour of soil samples under shearing and cannot draw stress paths
- Unable to explain the basis of the re-compaction requirement for preventing liquefaction failure of fill slopes
- Inadequate understanding of engineering geology and their engineering properties
- Ground settlement analyses and problems associated with ELS or tunnelling work
- Superficial understanding of slope stability analysis, e.g. limit equilibrium vs numerical analysis; Janbu vs Morgenstern and Price

Some Practical Tips

1 Technical and Experience Report (1 of 2)

- Prepare several projects involving various types of work vs focus on one or two projects *[depends on individual's experience]*

- Present design and site supervision experience related to geotechnical works *[make sure it represents your own work]* and demonstrate your knowledge of geotechnical design and construction practice in Hong Kong

- Present examples of problem-solving or site issues to demonstrate your approaches and use of engineering judgement to resolve them, and why you did it in that particular way

1 Technical and Experience Report (2 of 2)

- Demonstrate that the competences are achieved by adding notations in the right margin for the competences (e.g. C1, C2…etc.) next to the text passage *[quote at most 4 relevant competences at a time]*

- Check the **spelling** and **proofread** the report carefully!

- Get the report reviewed by your ES, senior or supporter(s) before submission

2 Presentation (1 of 2)

Be very careful in choosing the materials for your presentation *[usually a fairly recent project]*

Understand thoroughly all the figures, diagrams, photos and words in the presentation *[check the units and label all axes)*

2 Presentation (2 of 2)

- There is no need to try to cover all the competences/attributes in your presentation
- In choosing **site experience** as presentation topic, make sure you know something about the corresponding design aspects and considerations
- In choosing **design experience** as presentation topic, be prepared to answer questions on the construction details and buildability of your design

3 Interview (1 of 2)

- Have a firm grasp of the relevant geotechnical knowledge and principles, especially those related to your experiences
- Find out the backgrounds of your two assessors
- Arrive early and get accustomed to the atmosphere
- Keep calm & appear confident *[maintain normal eye contact]*
- Use graphical aids to illustrate or elaborate your answers

3 Interview (2 of 2)

- Be prepared for ‘achievement-oriented’ questions as well as ‘adversity-oriented’ questions
- If you do not know the answer, stay calm and try to obtain some more information from your assessors; then answer based on your basic knowledge and understanding of engineering principles
- Arrange for mock interviews if possible

4 Essay Writing

- Use simple sentences and simple English
- Prepare a draft writing plan or mind-map before starting the essay
- Be careful to avoid out-focus
- Achieve the minimum number of words (1,000)

Do's (1 of 2)

- Do proper preparation *[but not = memorizing answers]*
- Listen to the question carefully, para-phrase it or seek clarification as appropriate
- Practice and become comfortable to be thinking on your feet
- If you are not sure about the answer, try to break down the question into component parts and have a go at addressing certain parts by reference to the relevant knowledge in order to show what you know

Do’s (2 of 2)

- Be proactive in offering to use pen and paper to illustrate your ideas and answers
- Endeavour to provide specific examples to show that you have fulfilled the relevant competence requirements
- Understand what you did and why you did it that way

Don’t’s (1 of 2)

- Do not let your nerve affect your performance
- Do not try to memorize ‘model’ answers *[beware that the actual question asked might be somewhat different to your memorized model question]*
- Do not rush with your responses without hearing the entire question
- If you have no idea about the answer, do not just keep silent and gazing at the assessors

Don’t-s (2 of 2)

- Do not bluff *[better indicate that you are not familiar with the subject and proceed to tackle part by part, explaining the basis of your response]*

- Do not keep recalling in your head any bad or silly answers given by you to a previous question. Move on and focus on the new questions.

- Do not treat the interview as a typical examination per se – rather, it is to validate your competence as a professional

Proper preparation is of the essence (1 of 2)

Do not rush unduly with the application – obtain good, solid experience

But do not unduly procrastinate!

Read a good soil mechanics textbook to refresh yourself on the fundamental principles e.g. Craig (11th edition), or G.N. Smith (Granada)

Be conversant with the local technical standards and key guidance documents

Proper preparation is of the essence (2 of 2)

Plan your CPD carefully to fill in the ‘gaps’ and target the better ones

Build up a habit of keeping abreast of technical advances and technological development upon an ongoing basis *[do not just make a ‘last-minute dash’ to revise for an ‘exam’ and try to ‘guess’ the more popular questions]*

Arrange mock interviews [a light one may give the wrong impression]

Are past question banks useful or not? *[Probably won’t do any harm to get a feel but better refrain from just memorizing the Q&A]*

Key Elements of a Competent Geotechnical Professional

- **Knowledge** [*fundamental principles + up to date]*
- **Skills** *[modelling, analysis, evaluation, communication, technology savvy]*
- **Attitude** [both learning and working attitude, including *continuous improvement, proper assimilation of information, rigour in problem framing & solving, thinking out of the box, questioning the norms …….]*

And stay curious *[for knowledge]*

Watch out for these negative or ‘poisonous’ traits!

- Ignorance
- Carelessness
- Complacency

Some Myths!

- Application for MHKIE(G) has a high failure rate? …. *not really!*

- Failure cases tend to put the blame on the assessors…. and some assessors have a reputation for being ‘tough’ …. *in reality these assessors do not necessarily have a low passing rate*

- RRA between ICE and HKIE Geotechnical Discipline since 2015 – automatic transfer of professional membership? …. *Each case will be considered on its own merits - further assessment may be deemed necessary for discipline-matching purposes*