THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME "A" GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
GEOTECHNICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	1. Introduction			**1**
	1.1 Information about the Company			
Location 1	***Description 1***			
	1.1.1 Own Organisation			
	a) Discuss the size, history and internal culture of the trainee's own organisation.	*CCO 1.10*	11	
	b) Discuss an overview of the relationship between the trainee's own organisation, government departments and other organisations.	*CCO 1.10*	11	
	c) Discuss the structure and functions of different units within the trainee's own organisation.	*CCO 1.10*	11	
	d) Demonstrate the awareness to follow operational procedures and practices as required by the trainee's own organisation.	*CCO 1.10*	11	
	e) Discuss the objectives, requirements and processes that support the quality assurance system within the trainee's own organisation.	*CCO 1.10*	11	
	f) Apply the quality assurance system according to the policy of the trainee's own organisation.	*CCO 1.10*	11	
	1.1.2 Training Programme, Prospects and Career Development			
	a) Discuss an overview of the internal communication systems, training system and career development pathway within the trainee's own organisation.	*CCO 1.10*	11	

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	b) Demonstrate a commitment to extend and develop up-to-date technical knowledge through reading relevant engineering publications, participating in seminars or conferences, and information searching.	*CCO 1.2*	11	
	c) Demonstrate a commitment to extend and develop up-to-date knowledge of local, regional and international current affairs through reading relevant engineering publications, participating in seminars or conferences, and information searching.	*CCO 1.3*	11	
	d) Demonstrate a commitment to participate in the local organisations or community services for general personal development.	*CCO 1.3*	11	
	1.2 Information about the HKIE			
Location 2	***Description 2***			
	a) Discuss an overview of the HKIE organisation as well as its history and role in society.	*CCO 1.1*	11	
	b) Demonstrate commitment to participate in relevant activities organised by the HKIE.	*CCO 1.1*	11	
	2. Engineer as a Profession			**Conti-nuous**
	2.1 Professionalism			
Location 3	***Description 3***			
	a) Discuss the social and ethical responsibilities of engineers in society.	*CCO 1.2*	8	

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	b) Explain the rules and standard requirements of conducting engineering activities to the HKIE, employers, clients, general public and colleagues in accordance with the HKIE Rules of Conduct.	*CCO 1.2*	8	
	c) Explain the ethical standards and responsibilities of professional engineers as required by the HKIE.	*CCO 1.2*	8	
	d) Demonstrate the awareness to follow the codes of practice of professional engineers.	*CCO 1.2*	8	
	e) Demonstrate the awareness to uphold the dignity, standing and reputation of the engineering profession.	*CCO 1.2*	8	
	f) Demonstrate the awareness to protect the interests of the community including the environment, welfare, health and safety in conducting engineering activities.	*CCO 1.2*	8	
	g) Demonstrate awareness of developing trends in the industry such as BIM, advances in sensor technologies and data analytics, Digital Project Management and Design for Manufacture and Assembly (DfMA).	*New CO*	8	
	2.2 Occupational Safety and Health			
Location 4	***Description 4***			
	a) Demonstrate an understanding of the statutory health and safety requirements.	*CCO 1.5*	9	
	b) Demonstrate an understanding of the responsibilities of professional engineers for the health and safety of the employers, employees and general public when engaging in engineering activities.	*CCO 1.5*	9	
	c) Apply the safety management system in accordance with the industry standards and regulatory requirements.	*CCO 1.5*	7	

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	2.3 Environment and Sustainability			
Location 5	***Description 5***			
	a) Demonstrate an understanding of the relevant statutory environmental requirements related to the trainee's discipline.	*CCO 1.6*	9	
	b) Evaluate the inter-relationship of technology with the environment in the work place.	*CCO 1.6*	9	
	c) Demonstrate the awareness of the impact of technology on the environment in society.	*CCO 1.6*	9	
	d) Perform engineering activities in a way that contributes to sustainable development.	*CO 2.10*	9	
	e) Perform engineering activities in a way that secures stakeholder involvement in sustainable development.	*CO 2.10*	9	
	3. Investigation and Design (see Notes)			**52**
	3.1 Site Investigation			6
Location 6	***Description 6***			
	a) Comprehend site investigation practice and techniques for various geological materials	*CO 2.1*	1	
	b) Compile information on site investigation.	*CO 2.1*	1	
	c) Carry out desk studies and API.	*CO 2.1*	1	
	d) Carry out field inspections and mapping.	*CO 2.1*	1	
	e) Compile record of field inspections and mapping.	*CO 2.1*	10	
	f) Plan a ground investigation.	*CO 2.1*	12	
	3.2 Material Testing			6
Location 7	***Description 7***			
	a) Comprehend laboratory practice and techniques for selecting, preparing and testing soil, rock and construction materials specimens.	*CO 2.2*	1	
	b) Formulate laboratory test requirements.	*CO 2.2*	5	
	c) Assess test data in deriving design parameters.	*CO 2.2*	3	

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Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	3.3 Ground Modelling			8
Location 8	***Description 8***			
	a) Appraise soil and rock materials and mass characteristics.	*CO 2.3*	1	
	b) Classify soil and rock materials and mass characteristics.	*CO 2.3*	3	
	c) Formulate geological / geotechnical models from desk study and field data.	*CO 2.3*	4	
	3.4 Producing Geotechnical Assessment			16
Location 9	***Description 9***			
	a) Apply computer techniques to engineering geology, geotechnical analysis and design which are in regular use in the office for geotechnical assessment.	*CO 2.6*	1	
	b) Assess effects of engineering works on adjacent land and properties including the surface and ground water regime, and vice versa.	*CO 2.7*	3	
	c) Produce geotechnical assessment associated with at least two, and preferably more, of the following: i. slope / retaining wall ii. site formation iii. natural terrain hazards iv. foundations (with significant geotechnical content) v. deep excavations vi. tunnels / underground caverns vii. dredging and reclamation viii. ground improvement ix. sub-surface drainage measures x. natural resources exploitation (such as quarrying)	*CO 2.8*	3	

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Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	3.5 Producing Geotechnical Design			16
Location 10	***Description 10***			
	a) Apply computer techniques to engineering geology, geotechnical analysis and design which are in regular use in the office for geotechnical design.	*CO 2.6*	1	
	b) Undertake risk assessment associated with at least two, and preferably more, of items listed in 3.5(c).	*CO 2.8*	4	
	c) Produce geotechnical design associated with at least two, and preferably more, of the following: i. slope / retaining wall ii. site formation iii. natural terrain hazards iv. foundations (with significant geotechnical content) v. deep excavations vi. tunnels / caverns vii. dredging and reclamation viii. ground improvement ix. sub-surface drainage measures x. natural resources exploitation (such as quarrying)	*CO 2.8*	4	
	d) Comply with the Hong Kong Regulations, Design Standards, Codes of Practice and Technical Memoranda in regular use by the discipline.	*CO 1.7*	2	
	e) Assess alternative solutions from technical, safety, environmental and financial perspectives.	*CO 2.4*	3	
	f) Produce sketches and working drawings and 3-D models.	*CO 2.5*	1	
	g) Integrate sketches and working drawings with technical specifications.	*CO 2.5*	1	
	h) Integrate safety requirements in engineering design.	*CO 2.9*	9	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	i) Apply design-for-safety principles to engineer-out risks that could result in accidents.	*CO 2.9*	9	
	4. Construction and Supervision (see Notes)			**52**
	4.1 General			18
Location 11	***Description 11***			
	a) Carry out planning and programming of site works to meet changing conditions.	*CO 3.1*	6	
	b) Produce site records.	*CO 3.2*	10	
	c) Apply geotechnical monitoring and observational methods and procedures, including the verification of geotechnical deign assumptions during construction.	*CO 3.4*	1	
	d) Comprehend the use of surveying and setting out techniques in construction.	*CO 3.5*	1	
	e) Differentiate the plant and equipment commonly used in the execution of geotechnical works.	*CO 3.6*	3	
	f) Develop supervision plan for the execution of at least one, and preferably more, of the following geotechnical works: i. slope / retaining wall ii. site formation iii. natural terrain hazards iv. foundations (with significant geotechnical content) v. deep excavations vi. tunnels / underground caverns vii. dredging and reclamation viii. ground improvement ix. sub-surface drainage measures x. natural resources exploitation (such as quarrying)	*CO 3.7*	5	
	g) Assess the safety matters in the implementation process.	*CO 3.8*	3	
	h) Develop safe working practice in construction.	*CO 3.8*	4	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	4.2 Site Investigation			8
Location 12	***Description 12***			
	a) Carry out supervision of ground investigation work, field tests and installation of field instruments.	*CO 3.3*	2	
	4.3 Geotechnical Works			26
Location 13	***Description 13***			
	a) Carry out supervision of the execution of at least one, and preferably more, of the following geotechnical works: i. slope / retaining wall ii. site formation iii. natural terrain hazards iv. foundations (with significant geotechnical content) v. deep excavations vi. tunnels / underground caverns vii. dredging and reclamation viii. ground improvement ix. sub-surface drainage measures x. natural resources exploitation (such as quarrying)	*CO 3.7*	5	
	5. Project Management			**51**
	5.1 Project Management – Procedural			13
Location 14	***Description 14***			
	a) Apply the document control procedures for recording, checking, filing and retrieval of drawings, calculations, correspondence and project data.	*CO 1.1*	6	
	b) Comprehend the procedures for project implementation.	*CO 1.2*	6	
	c) Apply the procedures of quality assurance.	*CO 1.3*	1	
	d) Comply with the requirements of quality assurance.	*CO 1.3*	1	
	e) Explain the sources of and procedures for accessing geotechnical data in the public domain.	*CO 1.4*	2	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	f) Apply the procedures for making submissions to regulatory / checking authorities.	*CO 1.5*	2	
	5.2 Project Management – Financial			13
Location 15	***Description 15***			
	a) Comprehend the economic aspects of project appraisal including cost benefits, discounting and financial risks.	*CO 4.1*	7	
	b) Comprehend the processes and elements of project cost control.	*CO 4.2*	6	
	c) Carry out cost estimates.	*CO 4.3*	6	
	d) Carry out measurement and payment certification.	*CO 4.4*	6	
	e) Comprehend the procedures for and assessment of cost variations.	*CO 4.5*	6	
	f) Comprehend the use of cost and price fluctuation clause in a contract.	*CO 4.6*	6	
	5.3 Project Management – Contractual			13
Location 16	***Description 16***			
	a) Explain the relative merits of implementing construction works by using various forms of contracts.	*CO 5.1*	6	
	b) Produce relevant parts of technical specifications.	*CO 5.2*	6	
	c) Produce relevant parts of tender / contract documents.	*CO 5.3*	6	
	d) Produce relevant parts of project costing by taking off quantities.	*CO 5.4*	6	
	e) Explain the contractual relationship and relative roles and responsibilities between the Client / Employer, Engineer and Contractor in project implementation.	*CO 5.5*	6	
	f) Explain the role of the Engineer and his Representative and their responsibilities under the Contract, to the Client / Employer and to the public.	*CO 5.6*	6	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	g) Explain the circumstances and risks which may affect contract costs and construction period.	*CO 5.7*	6	
	h) Comprehend the procedures in dealing with contract risks and claims.	*CO 5.8*	6	
	5.4 Project Management – Leadership			12
Location 17	***Description 17***			
	a) Discuss the various leadership qualities required of a leader including accountability, conflict management and resources management, etc.	*CCO 1.9*	6	
	b) Explain the importance of accountability and responsibility required by a leader for making decisions on engineering activities.	*CCO 1.9*	6	
	c) Apply various management skills in engineering projects.	*CCO 1.9*	6	
	d) Distinguish the relationship between good leadership and good management skills.	*CCO 1.9*	6	
	e) Demonstrate an understanding of the importance of teamwork and partnering skills in engineering projects.	*CCO 1.9*	6	
	6. Other Common Core Outcomes for Continuous Development			**Conti-nuous**
	6.1 Development of Personal Qualities			
Location 18	***Description 18***			
	a) Identify appropriate innovative approach and/or tools for professional development.	*CCO 1.4*	11	
	b) Demonstrate interpersonal skills for professional development.	*CCO 1.4*	10	
	c) Demonstrate negotiating skills required for various engineering activities.	*CCO 1.4*	10	
	d) Demonstrate sound time management skills for professional development.	*CCO 1.4*	11	
	e) Demonstrate a commitment to continuous development and enhancement.	*CCO 1.4*	11	

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	6.2 Communication			
Location 19	***Description 19***			
	a) Communicate ideas orally in an accurate and clear manner under various situations (including presentations and meetings).	*CCO 1.7*	10	
	b) Formulate an oral presentation of complicated data and information in an effective and persuasive manner.	*CCO 1.7*	10	
	c) Produce grammatically correct, clear and concise documents (including memos, letters, instructions, reports, resumes and technical papers) which meet the business objectives.	*CCO 1.7*	10	
	d) Evaluate the needs of the intended readers to design appropriate technical contents for communication.	*CCO 1.7*	10	
	e) Apply appropriate communication skills including for example the use of BIM in dealing with various parties involved with or having an interest in a project.	*CO 1.6*	10	
	6.3 Human Resources Management			
Location 20	***Description 20***			
	a) Demonstrate the awareness of the duties and employment criteria for different job positions in an engineering project.	*CCO 1.8*	6	
	b) Demonstrate an understanding of the relevant legal requirements and regulatory issues of labour employment and management.	*CCO 1.8*	6	
	c) Discuss the appropriate staff training and development programmes in the organisation.	*CCO 1.8*	6	
	6.4 Business Operations			
Location 21	***Description 21***			
	a) Recognise the importance of intellectual property to business operations.	*CCO 1.11*	11	

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	b) Describe the legal requirements in Hong Kong relevant to intellectual property rights.	*CCO 1.11*	11	
	c) Identify appropriate tools and method to measure and improve the productivity of business operations.	*CCO 1.11*	11	
	d) Identify appropriate information technology applications to manage business information and to facilitate business operations.	*CCO 1.11*	11	
	e) Recognise the importance of research and development towards business operations.	*CCO 1.11*	11	
	f) Demonstrate the awareness of financial considerations in operating business.	*CCO 1.11*	11	
	g) Recognise the importance of business development in business operations.	*CCO 1.11*	11	
	h) Recognise the need to consider the whole life cycle cost of a project.	*New CO*	11	
	i) Recognise the importance of and apply 'virtual construction' tools such as BIM for digital simulations.	*New CO*	11	

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N.B.

1. For registration as a trainee, a graduate should possess an engineering degree with sufficient Geotechnical or Civil engineering content. Degrees not yet recognised by the HKIE will be assessed on a case-by-case basis by the HKIE and will advise on any necessary topping-up requirements.
2. The training period must not be less than 156 weeks (36 months).
3. The programme set out is for guidance only but substantial departure should not be made. Employers should endeavour to provide training to their trainees in as many areas as possible as is appropriate to the sector of employment.
4. All trainees should normally complete a 12-month period on site during the training period, of which at least six months should be in continuous full-time services resident on site. Not more than four months should be on supervision of ground investigation.
5. The training periods set out for Section 3 – Investigation and Design and Section 4 – Construction and Supervision are minimum only. Companies may shorten the time period for Section 5 – Project Management for additional time required for Section 3 or 4. However, the total time spent on each sub-section of Section 5 should not be less than 6 weeks and the total time spent on Section 5 should not be less than 24 weeks.
6. This guide should be read in conjunction with Section 3 of the M3 Routes to Membership.
7. During the training, each trainee is required to maintain a Graduate Training Log Book, Record of Continuing Professional Development and Record of Training Outcomes.