THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME "A" GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
MARINE & NAVAL ARCHITECTURE 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 a 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	
	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	
	2.3 Environment			
Location 5	***Description 5***			
	a) Demonstrate an understanding of the relevant statutory environmental requirements related to the trainee's discipline.	*CCO 1.6*	9	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	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	
	3. Engineering Fundamentals			**14**
	3.1 Common Engineering Metallic and Non-Metallic Materials			
Location 6	***Description 6***			
	a) Evaluate different types and properties of common engineering metallic and non-metallic materials.	*CO 1.1*	5	
	b) Select the appropriate types of material for a particular engineering purpose.	*CO 1.1*	5	
	c) Comprehend the specifications of common engineering metallic and non-metallic materials.	*CO 1.1*	1	
	d) Demonstrate an understanding of surface coating / finishing process.	*CO 1.1*	1	
	3.2 Material Shaping Processes			
Location 7	***Description 7***			
	a) Describe the manual and computer aided methods for material shaping processes.	*CO 1.2*	1	
	b) Identify the appropriate operational parameters for the material shaping processes.	*CO 1.2*	1	
	c) List the reliability factors of material shaping processes.	*CO 1.2*	1	
	d) Recognise the importance of machine accuracy and product quality in material shaping processes.	*CO 1.2*	1	
	3.3 Material Forming Processes			
Location 8	***Description 8***			
	a) Describe manual and computer aided methods for material forming processes.	*CO 1.3*	1	
	b) Describe sheet metal forming processes.	*CO 1.3*	1	
	c) Describe mould and die forming processes.	*CO 1.3*	1	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	d) Describe sheet extrusion forming processes.	*CO 1.3*	1	
	3.4 Material Joining Processes			
Location 9	***Description 9***			
	a) Assess different welding methods and the corresponding procedures and applications.	*CO 1.4*	3	
	b) Appraise the NDT results and the corresponding correction actions.	*CO 1.4*	1	
	c) Assess different mechanical fastening methods and the applications.	*CO 1.4*	3	
	3.5 Operational Reliability			
Location 10	***Description 10***			
	a) Carry out planned maintenance procedures.	*CO 1.5*	6	
	b) Describe the applications and limitations of different lubricants.	*CO 1.5*	1	
	c) Comprehend the function and failure mode of key component / system / machinery and the corresponding monitoring criteria for maintenance.	*CO 1.5*	7	
	3.6 Engineering Design Fundamentals			
Location 11	***Description 11***			
	a) Design solutions that comply with relevant codes of practice or meet recognised engineering standard of practice in Hong Kong.	*CO 1.6*	2	
	b) Assess the requirements of different stages of design.	*CO 1.6*	4	
	c) Produce clear design specifications that may be understood and interpreted without significant elaboration.	*CO 1.6*	4	
	d) Plan the information retrieval process.	*CO 1.6*	3	
	e) Perform selection analysis of materials and components.	*CO 1.6*	3	
	f) Produce detail cost breakdown of each individual component of project.	*CO 1.6*	6	
	g) Evaluate the design with different perspectives.	*CO 1.6*	3	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	h) Apply Computer Aided Design (CAD) in the engineering design process.	*CO 1.6*	1	
	4. Engineering Analysis, Application and Innovation			**46**
	4.1 Engineering Analysis and Creativity			8
Location 12	***Description 12***			
	4.1.1 Definition of an Engineering Problem			
	a) Appraise thinking / analytical process to define work problem.	*CO 2.1*	3	
	b) Compile basic data to identify work problem.	*CO 2.1*	3	
	4.1.2 Recommendation of Practical Solutions			
	a) Propose various practical solutions for an engineering problem taking into consideration of the concepts and precedents, sources of information, budget estimates and quotations, brief design methods and environmental impacts.	*CO 2.2*	4	
	b) Produce clear and concise feasibility reports.	*CO 2.2*	6	
	4.1.3 Application of Standards			
	a) Appraise the related details of the local and / or international standards and codes of practice.	*CO 2.3*	1	
	b) Comply with the local and / or international standards and codes of practice in solving problems.	*CO 2.3*	1	
	4.1.4 Decision on Final Solution			
	a) Justify the recommendation of practical solutions for an engineering problem.	*CO 2.4*	12	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	4.2 Engineering Applications and Innovation			26
Location 13	***Description 13***			
	Choose either 4.2.1(a) or 4.2.1(b)			
	4.2.1 (a) Performing Engineering Practices in Marine Engineering			
	a) Carry out marine engineering operation / repair / manufacturing processes.	*CO 3.1*	3	
	b) Carry out design of marine components / products, system / equipment of engineering applications.	*CO 3.1*	4	
	c) Carry out inspection and surveying of marine engineering applications.	*CO 3.1*	3	
	d) Carry out testing and commissioning of processes of marine engineering applications.	*CO 3.1*	6	
	e) Carry out the operation / maintenance processes.	*CO 3.1*	3	
	4.2.1 (b) Performing Engineering Practices in Naval Architecture			
	a) Carry out ship design / design appraisal from functional perspective including general arrangement and lines plan etc.	*CO 3.1*	4	
	b) Carry out ship design / design appraisal from structural perspective including Midship section, profile and deck structure erection and fabrications.	*CO 3.1*	4	
	c) Carry out ship design / design appraisal from stability perspective including hydrostatic, subdivision, stability booklet, lightship survey and incline experiment.	*CO 3.1*	4	
	d) Evaluate the ship propulsion system including resistance estimation.	*CO 3.1*	3	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	e) Appraise the ship propulsion system including powering requirement and propeller.	*CO 3.1*	4	
	f) Design or appraise the safety plan including relevant standards on lifesaving appliances, fire protection arrangements and fighting appliances.	*CO 3.1*	4	
	g) Conduct sea trial for a ship.	*CO 3.1*	6	
	4.3 Environmental Consideration			4
Location 14	***Description 14***			
	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) Develop engineering solution with environmental considerations.	*CO 3.2*	9	
	e) Comply with relevant international regulations and codes of practice in developing solutions.	*CO 3.2*	1	
	4.4 Production of Specifications			4
Location 15	***Description 15***			
	a) Examine the technical specifications of an engineering project.	*CO 3.3*	3	
	b) Select appropriate specifications of an engineering project.	*CO 3.3*	5	
	c) Produce the technical specifications of an engineering project.	*CO 3.3*	6	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	4.5 Implementation of Quality Control			4
Location 16	***Description 16***			
	a) Discuss the objectives, requirements and processes that support the quality assurance system within the trainee's own organisation.	*CCO 1.10*	11	
	b) Carry out implementation of quality control.	*CO 3.5*	11	
	c) Apply the quality assurance system according to the policy of the trainee's own organisation.	*CO 3.5*	11	
	d) Appraise the quality control methods and principles in meeting the required specifications.	*CO 3.5*	2	
	e) Evaluate the feedbacks collected for project progress monitoring.	*CO 3.5*	3	
	f) Produce a quality control plan in accordance with relevant information / data / drawings / work instructions.	*CO 3.4* *CO 3.5*	10	
	5. Engineering Administration and Management			**17**
	5.1 Stores and procurement procedure			
Location 17	***Description 17***			
	5.1.1 Tendering procedure			
	a) Discuss the objectives, requirements and processes that support the tendering system within the trainee's own organisation.	*New CO*	11	
	b) Carry out the implementation of tendering activities.	*New CO*	11	
	c) Apply the tendering system according to the policy of the trainee's own organisation.	*New CO*	11	
	5.1.2 Stores control and record			
	a) Discuss the objectives, requirements and processes that support the stores control and record system within the trainee's own organisation.	*New CO*	11	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	b) Carry out implementation of stores control and record activities.	*New CO*	11	
	c) Apply the stores control and record system according to the policy of the trainee's own organisation.	*New CO*	11	
	5.2 Project and Safety Management			
Location 18	***Description 18***			
	5.2.1 Contract Management			
	a) Demonstrate an understanding of a contract with respect to the discrete duties and responsibilities of all the parties involved.	*CO 3.4*	2	
	b) Demonstrate an understanding of the facilities for the issue, receipt, registration and filing of work instructions and drawings and their amendments.	*CO 3.4*	2	
	5.2.2 Safety Management			
	a) Appraise the importance of safety at work.	*CO 3.6*	2	
	b) Develop procedures of good safety practice.	*CO 3.6*	4	
	c) Examine the duties and responsibilities of every team member in creating a safe environment.	*CO 3.6*	2	
	5.2.3 Planning and Programming of a Project			
	a) Prepare a detailed project plan with considerations on all internal and external constraints.	*CO 4.2*	6	
	5.2.4 Budgeting of a Project			
	a) Evaluate the cost estimation for the preferred solution of a problem.	*CO 4.3*	3	
	b) Prepare the budget of a project by considering the various cost indices including construction costs, operation costs, maintenance costs, labour and material costs.	*CO 4.3*	6	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	5.2.5 Preparation of Records a) Produce a clear and concise Quarterly Report (QR) to record all above engineering practice activities. In addition, achievements of activities should be elaborated in details in the QR.	*New CO*	10	
	6. Direct Objective Training			**26**
	This section covers training in any activities related to Marine & Naval Architecture engineering. It should aim to develop skills and knowledge relating to personal qualities, communication, human resources management and business operational sense in addition to the technical, commercial and engineering knowledge acquired by the trainees during earlier parts of their training. Latest developments in the discipline should be included. All Training Outcomes, if not yet achieved in earlier parts of training, should be completed here.			
	7. Other Common Core Outcomes for Continuous Development			**Conti-nuous**
	7.1 Leadership and Management			
Location 19	***Description 19***			
	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	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	7.2 Development of Personal Qualities			
Location 20	***Description 20***			
	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	
	7.3 Communication			
Location 21	***Description 21***			
	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	
	7.4 Human Resources Management			
Location 22	***Description 22***			
	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	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref.	Length of Time (weeks)
	c) Discuss the appropriate staff training and development programmes in the organisation.	*CCO 1.8*	6	
	7.5 Business Operations			
Location 23	***Description 23***			
	a) Recognise the importance of intellectual property to business operations.	*CCO 1.11*	11	
	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	

N.B.

1. The training period must not be less than 104 weeks (24 months).
2. 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.
3. This guide should be read in conjunction with Section 3 of the M3 Routes to Membership.
4. During the training, each trainee is required to maintain a Graduate Training Log Book, Record of Continuing Professional Development and Record of Training Outcomes.
5. Block exemptions of 34, 41 and 41 weeks will be granted for registered trainees with Certificate of Competency (CoC) (Marine Engineer Officer) in Class 3, Class 2, and Class 1 respectively. Exemption requests should be made in accordance with the procedures detailed in TN-F.