

**THE HONG KONG INSTITUTION OF ENGINEERS**  
**CONSOLIDATED MODEL TRAINING GUIDE**  
**FOR FORMAL TRAINING SCHEME TO ASSOCIATE MEMBERSHIP**  
**BUILDING SERVICES ENGINEERING**

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref. (Associate Members)	Length of Time (weeks)
	<b>1. Introduction</b>			<b>1</b>
	1.1 Information about the Company			
<i>Location 1</i>	<i>Description 1</i>			
	1.1.1 Own Organisation			
	a) Discuss the size, history and internal culture of the trainee's own organisation.	CCO(AM) 1.2(a)	11	
	b) Discuss an overview of the relationship between the trainee's own organisation, government departments and other organisations.	CCO(AM) 1.2(b)	11	
	c) Discuss the structure and functions of different units within the trainee's own organisation.	CCO(AM) 1.2(c)	11	
	d) Demonstrate the awareness to follow operational procedures and practices as required by the trainee's own organization.	New CCO	11	
	1.1.2 Quality Assurance			
	a) Discuss the objectives, requirements and processes that support the quality assurance system within the trainee's own organisation.	CCO(AM) 1.7(b)	11	
	b) Apply the quality assurance system according to the policy of the trainee's own organisation.	CCO(AM) 1.7(b)	11	
	1.1.3 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 organization.	New CCO	11	
	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(AM) 1.3(d)	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(AM) 1.6(a)	11	
	d) Demonstrate a commitment to participate in the local organisations or community services for general personal development.	CCO(AM) 1.6(b)	11	
	1.2 Information about the HKIE			
<i>Location 2</i>	<i>Description 2</i>			
	a) Discuss an overview of the HKIE organisation as well as its history and role in society.	CCO(AM) 1.1(a)	11	
	b) Demonstrate a commitment to participate in relevant activities organised by the HKIE.	CCO(AM) 1.1(b)	11	

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	<b>2. Professionalism</b>			<b>Continuous</b>
	2.1 Conduct and Responsibilities			
<b>Location 3</b>	<b>Description 3</b>			
	a) Discuss the social and ethical responsibilities expected in the society.	CCO(AM) 1.3(a), (c)	8	
	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(AM) 1.3(b)	8	
	c) Explain the ethical standards and responsibilities required by the HKIE.	CCO(AM) 1.3(c)	8	
	d) Demonstrate the awareness to follow the codes of practice required by the industry.	CCO(AM) 1.3(c)	8	
	e) Demonstrate the awareness to uphold the dignity, standing and reputation of the engineering profession.	New CCO	8	
	f) Demonstrate the awareness to protect the interests of the community including the environment, welfare, health and safety in conducting engineering activities.	New CCO	8	
	2.2 Occupational Safety and Health			
<b>Location 4</b>	<b>Description 4</b>			
	a) Demonstrate an understanding of the statutory health and safety requirements.	CCO(AM) 1.4(a)	9	
	b) Demonstrate an understanding of the responsibilities for the health and safety of the employers, employees and general public when engaging in engineering activities.	CCO(AM) 1.4(b)	9	
	c) Plan the operation of safety management system in accordance with the industry standards and regulatory requirements.	CCO(AM) 1.4(c)	7	
	2.3 Environment			
<b>Location 5</b>	<b>Description 5</b>			
	a) Demonstrate an understanding of the relevant statutory environmental requirements related to the trainee's discipline.	CCO(AM) 1.5(a)	9	
	b) Demonstrate the awareness of the inter-relationship of technology with the environment in the work place.	CCO(AM) 1.5(b)(i)	9	
	c) Demonstrate the awareness of the impact of technology on the environment in society.	CCO(AM) 1.5(b)(ii)	9	
	<b>3. Building Services Engineering Practice, Design and Projects</b>			<b>46</b>
	<i>The aim of the training is to develop the trainee with good multi-disciplinary knowledge in building services and he/she becomes competent in at least one particular discipline.</i>			
	3.1 Basic Engineering Practice			12
<b>Location 6</b>	<b>Description 6</b>			
	a) Demonstrate an understanding of the Core Building Services Engineering principles	CO(AM) 1.1	1	
	b) Appraise the properties of materials for building services components such as types, specification, usage, special treatment, surface coating / finishes, painting, anti-corrosion application etc.	CO(AM) 1.2	1	

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	<ul style="list-style-type: none"> <li>c) Appraise the applications of cabling and motor connection, lighting installation, Shield against EMI, etc.</li> <li>d) Apply appropriate methods and standards for materials shaping forming and assembly such as ducts, panels, pipes, conduits, trunkings and cable trays.</li> <li>e) Apply appropriate methods, standards and testing for installation mounting, anchoring, fixing, jointing and support.</li> <li>f) Examine the impacts from thermal expansion, building movement, noise and vibration, electrical shock and stray current etc.</li> <li>g) Carry out the application of building services systems.</li> <li>h) Demonstrate an understanding of the industrial standard and specifications of building services systems and equipment.</li> <li>i) Demonstrate the knowledge to use building services hand/power tools and computer aided machines.</li> </ul>	<p><i>CO(AM) 1.2</i></p> <p><i>CO(AM) 1.3</i></p> <p><i>CO(AM) 1.4</i></p> <p><i>CO(AM) 1.4</i></p> <p><i>CO(AM) 1.6</i></p> <p><i>CO(AM) 1.6</i></p> <p><i>CO(AM) 1.3</i></p> <p><i>CO(AM) 1.4</i></p> <p><i>CO(AM) 1.5</i></p>	<p>1</p> <p>5</p> <p>5</p> <p>3</p> <p>1</p> <p>1</p> <p>1</p>	
	3.2 Engineering Design			18
<b>Location 7</b>	<b>Description 7</b>			
	<ul style="list-style-type: none"> <li>a) Demonstrate an understanding of design information at different stages of building services design.</li> <li>b) Discuss the codes of practice, specifications and standards of building services design.</li> <li>c) Carry out computer aided engineering application.</li> </ul> <p><i>(At least 2 of the followings)</i></p> <ul style="list-style-type: none"> <li>d) Examine the specifications, statutory requirements and utilities planning for building services systems.</li> <li>e) Assess the client requirements, spatial planning, cost estimates and alternative solutions of building services systems.</li> <li>f) Evaluate other important design aspects such as energy efficiency, environmental impacts, buildability and maintainability etc.</li> </ul>	<p><i>CO(AM) 2.1</i></p> <p><i>CO(AM) 2.1</i></p> <p><i>CO(AM) 2.2</i></p> <p><i>CO(AM) 2.3</i></p> <p><i>CO(AM) 2.3</i></p> <p><i>CO(AM) 2.3</i></p>	<p>4</p> <p>2</p> <p>1</p> <p>3</p> <p>12</p> <p>3</p>	
	3.3 Installation, Inspection, Testing, Commissioning, Operation and Maintenance			16
<b>Location 8</b>	<b>Description 8</b>			
	<p><u>Installation, Inspection, Operation and Maintenance Aspects</u></p> <ul style="list-style-type: none"> <li>a) Demonstrate an understanding of the process of production of plants and related site supervision works.</li> <li>b) Demonstrate knowledge of installation and workmanship standards and skills in identification of sub-standard works.</li> <li>c) Examine different types of maintenance systems and programmes such as preventive maintenance programmes for reliability and maintainability, safety considerations, emergency and major repair, and Computer Aided Maintenance Management etc.</li> </ul>	<p><i>CO(AM) 3.5 &amp; CO(AM) 3.6</i></p> <p><i>CO(AM) 3.5 &amp; CO(AM) 3.6</i></p> <p><i>CO(AM) 3.5 &amp; CO(AM) 3.6</i></p>	<p>2</p> <p>2</p> <p>2</p>	

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	d) Evaluate building operation and maintenance aspects such as energy efficiency, environmental assessment etc. <u>Building Automation and Instrumentation</u> a) Appraise building automation and control systems. b) Assess appropriate instruments with considerations such as range, accuracy, performance monitoring and calibration. <u>Testing and Commissioning</u> a) Appraise the procedures in the preparation of testing and commissioning for building services systems.	CO(AM) 3.5 & CO(AM) 3.6  CO(AM) 3.1 & CO(AM) 3.3 CO(AM) 3.1 & CO(AM) 3.3  CO(AM) 3.2	2  1 2  1	
	<b>4. Engineering Contract Administration and Management</b>			<b>39</b>
	4.1 Contract Management			31
<b>Location 9</b>	<b>Description 9</b>			
	a) Produce or assess client requirements, specifications and drawings.* b) Develop engineering drawings. c) Evaluate tender documents. d) Examine installation progress against schedule and make necessary amendment. e) Produce preliminary draft of operation and maintenance contracts.* f) Develop plan to monitor the operation and maintenance contracts.* g) Understand the contractual terms such as general and special conditions of contract. h) Appraise the guarantees and defects during the Defects Liability Period. *As appropriate to the company.	CO(AM) 4.1  CO(AM) 4.1 CO(AM) 4.2 CO(AM) 4.3  CO(AM) 4.2  CO(AM) 4.5 & CO(AM) 4.6 New CO  CO(AM) 3.2	6 6 6 5  6  6 6  1	
	4.2 Budgeting and Programming			4
<b>Location 10</b>	<b>Description 10</b>			
	a) Produce preliminary draft of the project budget plan, work scheduling, quality plan, safety plan and procurement procedures etc. b) Produce appropriate reports for project progress monitoring.	CO(AM) 3.4 & CO(AM) 4.4  CO(AM) 4.7	6  10	
	<b>5. Technology in Specialised Area</b>			<b>4</b>
	5.1 Technology Application			
<b>Location 11</b>	<b>Description 11</b>			
	a) Apply technology to the design, installation, testing, commissioning, maintenance and improvement of one of the following areas: <ul style="list-style-type: none"> <li>▪ HVAC System</li> <li>▪ Electrical Services System</li> <li>▪ Plumbing and Drainage System</li> <li>▪ Fire Services System</li> <li>▪ Vertical Transportation System</li> <li>▪ Others as appropriate</li> </ul>	CO(AM) 5.1	1	

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	<b>6. Consolidating Stage</b>			<b>18</b>
<b>Location 12</b>	<b>Description 12</b>			
	<i>This section covers any activities related to building services 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.</i>			
	<b>7. Other Common Core Outcomes for Continuous Development</b>			<b>Contin-uous</b>
	7.1 Leadership and Management			
<b>Location 13</b>	<b>Description 13</b>			
	a) Discuss the various leadership qualities required of a leader including accountability, conflict management and resources management etc.	CCO(AM) 1.12(a)	6	
	b) Explain the importance of accountability and responsibility required by a leader for making decisions on engineering activities.	CCO(AM) 1.12(a)	6	
	c) Apply various management skills in engineering projects.	CCO(AM) 1.12(b)	6	
	d) Distinguish the relationship between good leadership and good management skills.	CCO(AM) 1.12(c)	6	
	e) Demonstrate an understanding of the importance of teamwork, partnering and supervision skills in engineering projects.	CCO(AM) 1.12(d)	6	
	7.2 Development of Personal Qualities			
<b>Location 14</b>	<b>Description 14</b>			
	a) Identify appropriate innovative approach and/or tools for professional development.	CCO(AM) 1.10(a)	11	
	b) Demonstrate interpersonal skills for professional development.	CCO(AM) 1.10(b)	10	
	c) Demonstrate negotiating skills required for various engineering activities.	CCO(AM) 1.11(d)	10	
	d) Demonstrate sound time management skills for professional development.	New CCO	11	
	e) Demonstrate a commitment to continuous development and enhancement.	New CCO	11	
	7.3 Communication			
<b>Location 15</b>	<b>Description 15</b>			
	a) Communicate ideas orally in an accurate and clear manner under various situations (including presentations and meetings).	CCO(AM) 1.11(a)	10	
	b) Formulate an oral presentation of complicated data and information in an effective and persuasive manner.	CCO(AM) 1.11(a)	10	
	c) Produce grammatically correct, clear and concise documents (including memos, letters, instructions, reports and resumes) which meet the business objectives.	CCO(AM) 1.11(b)	10	

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	d) Evaluate the needs of the intended readers to design appropriate technical contents for communication.	<i>CCO(AM) 1.11(b)</i>	10	
	7.4 Human Resources Management			
<b>Location 16</b>	<b>Description 16</b>			
	a) Demonstrate the awareness of the duties and employment criteria for different job positions in an engineering project.	<i>CCO(AM) 1.8(a)</i>	6	
	b) Demonstrate an understanding of the relevant legal requirements and regulatory issues of labour employment and management.	<i>CCO(AM) 1.8(b)</i>	6	
	c) Discuss the appropriate staff training and development programmes in the organisation.	<i>CCO(AM) 1.8(c)</i>	6	
	7.5 Business Operations			
<b>Location 17</b>	<b>Description 17</b>			
	a) Recognise the importance of intellectual property to business operations.	<i>New CCO</i>	11	
	b) Describe the legal requirements in Hong Kong relevant to intellectual property rights.	<i>New CCO</i>	11	
	c) Identify appropriate tools and method to measure and improve the productivity of business operations.	<i>CCO(AM) 1.7(a)</i>	11	
	d) Identify appropriate information technology applications to manage business information and to facilitate business operations.	<i>CCO(AM) 1.7(d)</i>	11	
	e) Recognise the importance of research and development towards business operations.	<i>CCO(AM) 1.7(e)</i>	11	
	f) Demonstrate the awareness of financial considerations in operation business.	<i>CCO(AM) 1.7(c)</i>	11	
	g) Recognise the importance of business development in business operations.	<i>New CCO</i>	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 M4 Routes to Membership.
  4. During the training, each trainee is required to maintain Training Log Book, Record of Continuing Professional Development and Record of Training Outcomes.