

## **Competence Profiles for MHKIE(Mechanical Discipline) Applicant via Formal Training or General Experience Route Guidance Note for Applicants and Assessors**

### **Purpose**

This guidance note (GN) serves to provide general reference and facilitate the Applicant's preparation of the MHKIE Mechanical Discipline (MHKIE (MCL)) application and Professional Assessment via both the formal training route and the general experience route. The GN also serves as a reference for Assessors considering and preparing recommendations for Professional Assessment interviews with Applicant.

This GN is advisory in nature and is designed to facilitate the Applicant's preparation of the application. It should not be construed in any way as superseding the relevant requirements stipulated on the HKIE website for MHKIE admission application.

Applicants must read this GN in conjunction with M3 Routes to Membership.

### **Introduction**

Competence-based Professional Assessment has been implemented for application after 1 April 2019. In 2020/21, all received applications are assessed in accordance with competence-based requirements. HKIE provided seminars and training on general requirements for competence-based assessments.

Applicant with mechanical engineering experience has to fulfill the 12 competences in the areas of Applying Mechanical Engineering Knowledge, Developing Technical Solutions, Managing Engineering Work, and Upkeeping Professional Acumen for MHKIE (MCL) membership.

### **Application and Professional Assessment Interview for MHKIE (MCL)**

#### *Application*

Before preparing the application, the Applicant should go through the details of relevant information on the HKIE web site, including Information on Membership Classes, Routes to Membership, Application Form requirements, and confirm if their academic qualifications,

professional experiences, CPD hours, etc. satisfy MHKIE (MCL) requirements. A quick checklist is shown in **Appendix 1** for easy reference.

The Discipline Advisory Panel (Mechanical) (DAP (MCL)), with the endorsement of the Qualification and Membership Board, considered that with evidence to support the experience profiles in various mechanical engineering aspects in **Appendix 2** would satisfy the MHKIE competence requirements in MCL.

When composing the Training and Experience Report, it is advised that the Applicant make reference to the exemplars in **Appendix 3**. It is advised that the report be organized in the four main areas below to show the applicant's professional experiences fulfilling the 12 competences:

- (i) Applying Mechanical Engineering Knowledge (C1, C2, C11)
- (ii) Developing Technical Solutions (C3, C4)
- (iii) Managing Engineering Work (C5, C6, C7, C12)
- (iv) Upkeeping Professional Acumen (C8, C9, C10)

#### *Interview*

The Applicant should prepare a 15-minute presentation of the projects they have submitted, along with any necessary records, plans, calculations, images, etc., to illustrate their professional experiences. The objective is to test the Applicant's presentation skills as a professional engineer.

Suggested allocation of time for a 15-minute presentation:

- 2-minute Introduction of Applicant's academic qualifications, training and professional/responsible experiences;
- 4-minute Project experiences for applying mechanical engineering knowledge;
- 4-minute Project experiences for developing technical solutions for complex engineering problems;
- 3-minute Management experiences for complex engineering works or activities;
- 2-minute Experiences for upkeeping professional acumen;

The presentation slide should be concise and precise. For example, a presentation's slides should typically cover three main points and be constrained inside a minute. If the Applicant spend too much time on one slide, the explanation of the elements may not be evident. On a slide, images, diagrams, or drawings should be shown clearly. It is improper to copy information from the report onto the slide. Reports, plans, computations, images, etc., should

be summarized into relevant bullet points in a way that makes them easier to discuss in an interview. To encourage discussion, images should be cropped or zoomed to the proper scale.

The Applicant should prepare evidence of his or her experiences in the interview to support the fact that all the competences set out in the HKIE Competence Standard for Professional Engineers (Corporate Members) are achieved. The Applicant should demonstrate that they have spent sufficient time on appropriate projects and reflect on their training and work experience.

## Appendix 1 - Quick Checklist for Application Documents

### Understand the requirements of MHKIE (MCL) Application

#### 1. Requirements of Education, Training and Responsible Experience for MHKIE(MCL) Application

To be a MHKIE, an Applicant needs to satisfy the education, training, and responsible experience requirements. The following parts summarize the requirements for application via the Formal Training Route and the General Experience Route.

Applicant via Formal Training Route	
Age:	25 or above
Education:	A first degree (Honours) accredited by the HKIE or an accredited first degree as listed in the Washington Accord <sup>(1)</sup>
Training:	2-year HKIE Scheme “A” Training for MCL Discipline
Experience:	Min. 2 years of <b>Responsible Experience</b> <sup>(2)</sup>

Applicant via General Experience Route	
Age:	25 or above
Education:	A first degree (Honours) accredited by the HKIE or an accredited first degree as listed in the Washington Accord <sup>(1)</sup>
Experience:	5 years of General Experience + Min. 1 Year of <b>Responsible Experience</b> (Total 6 years)

#### Remarks:-

(1) Other Honours degree level qualification in engineering or technology or combination of academic qualifications may be considered for the class of Member based on an individual assessment. Details may be found in the HKIE document – M3 Routes to Membership.

(2) **Responsible Experience:** Experience of exercising judgment and undertaking responsibility in a professional capacity. This is useful for your preparation of the “Training and Experience Report” and Professional Assessment interview.

#### 2. The HKIE Competence Standard for Professional Engineers (Corporate Members)

The HKIE Competence Standard for Professional Engineers (Corporate Members)

established in four broad areas sets the standard expected for engineers seeking professional recognition as Corporate Members by undertaking a competence-based assessment administered by the HKIE. The Applicant should demonstrate all the competences set out in the HKIE Competence Standard for Professional Engineers (Corporate Members).

Area #1 – Applying Mechanical Engineering Knowledge <sup>(3)</sup>	
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.
Area #2 – 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.
Area #3 – Managing Engineering Works	
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.
Area #4 – 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.

Remarks:

(3) **Mechanical Engineering Knowledge:**

For easy reference, Applicant may take note that the HKIE has defined the following seven core subjects as the Minimum Core Subject Areas (MCSA) for MCL Discipline for Scheme “A” Training: -

- (i) Solid Mechanics
- (ii) Fluid Mechanics
- (iii) Thermal Engineering
- (iv) Engineering Materials
- (v) Design and Manufacturing
- (vi) Automatic & Control Systems
- (vii) Dynamic & Mechanism

### 3. **Written Communication**

MCL Discipline is under the pilot scheme of adopting the results of English language tests in lieu of an essay or technical write-up in the Professional Assessment for Membership Admission via the General Experience and Formal Training Routes.

At the time of application, Applicant can provide one of the following in lieu of writing assessment: -

- Common Recruitment Examination Use of English Level 1
- IELTS Academic result with an overall band score of 6.0 or above, and a band score of 6.0 or above for each section (Listening, Reading, Writing and Speaking)
- Hong Kong Diploma of Secondary Education Examination English Language Level 4

No validity period would be set for the language test results.

## Prepare for submitting the Application

According to application form (Form 1/MD) and M3 Routes to Membership, a number of documents, report, proof, endorsed copies, CPD record, etc. should be provided in the MHKIE(MCL) application.

### *Documents for MHKIE (MCL) Application*

#### 1. **Application Form (Form 1/MD) (the latest version is available on the HKIE website)**

- Form 1/MD required the Applicant to provide information on personal details, academic qualifications, professional qualifications, formal training, professional experience, and attestation by supporters.
- **Attestation by Supporters:** four Corporate members of the HKIE, one of whom shall be a Fellow, and two of the four must be in the same Discipline as the Applicant. The supporter who is a Fellow and is in the same Discipline can be counted towards both of these requirements.
- “Certified True Copies” of all relevant documents are required. Endorsement by at least **one Corporate Member** of the HKIE (who may be the supporters) on photocopies of documents (in **A4 size**) would be sufficient.
- The other requirement for submitting format and minor details should refer to the relevant membership documentation and application forms for details.

#### 2. **Training and Experience Report**

- The report is to provide evidence to demonstrate the Applicant meets the HKIE Competence Standard for Professional Engineers (Corporate Members). It is suggested to mention about three to four projects to demonstrate Applicant’s competence.
- The report should be between **1,600 and 2,000 words** in English, typewritten on **single sides of A4** paper and **submit in duplicate**.
- The Applicant should take note on the following when writing the Training and Experience Report:
  - (i) Describe in chronological order the tasks in which they have been

employed; state the precise position they have occupied in each case; and describe clearly the degree of responsibility they have been assigned. The Applicant must set out the specific periods of training and experience that they have acquired in chronological order, giving inclusive dates in months and years.

- (ii) Use the first person (I, me, my) to show their personal contribution.
- (iii) Indicate the size and cost of the works.
- (iv) Elaborate on any particular problems they have encountered and how they arrived at viable solutions.
- (v) Provide evidence to demonstrate that the competences set out in the HKIE Competence Standard for Professional Engineers (Corporate Members) are achieved by adding notations in the right margin for the competences (C1, C2, etc.) next to the passage of text. At most four relevant competences should be quoted at a time.

### 3. CPD Records

#### **Applicant via Formal Training Route (i.e. applicable for Scheme “A” trainee)**

- A minimum average of 45 hours per year, from the commencement date of Scheme “A”, up to applying for Professional Assessment. Scope of CPD applied for CPD hours attained during the 2-Year Scheme “A” Training Period only. If the Applicant applied for MHKIE (MCL) with a total of four years of working experience, the minimum total CPD hours would be equal to  $45 \times 4 = 180$  hours.
- In-house CPD activities should account for a maximum of 50% of CPD hours claimed.
- The CPD record should be endorsed by Engineering Supervisor (For Scheme “A” Trainee) or a Responsible Person (i.e. normally an appropriate senior person in the employing organization).

#### **Applicant via General Training Route**

- A minimum average of 45 hours per year for six years immediately prior to the Applicant’s application for Professional Assessment. The CPD hours should be



balanced between technical and contractual or professional subjects. If the Applicant applied for MHKIE (MCL) with a total of six years of working experience, the minimum total CPD hours would be equal to  $45 \times 6 = 270$  hours.

- In-house CPD activities should account for a maximum of 50% of CPD hours claimed.
  
- The CPD record should be endorsed by a Responsible Person (i.e. normally an appropriate senior person in the employing organization).

#### 4. Checklist of Documents for Formal Training Route of MHKIE(MCL)

##### Application

- The Applicant can make use of the checklist below to confirm all the required documents have already been prepared and certified by a supporter (if required) before submission of the MHKIE (MCL) Application.
- The application shall be submitted by hand to HKIE Headquarters or by post.

✓	Certified by 1 Supporter	Documents																
<input type="checkbox"/>	Required	Filled Application Form 1/MD, <b>with 4 supporters' signature</b>																
<input type="checkbox"/>	Required	Certified True Copy of Applicant's Bachelor Degree certificate																
<input type="checkbox"/>	Required	Certified True Copy of Applicant's Master Degree certificate (if any)																
<input type="checkbox"/>	Required	Certified True Copy of Applicant's Professional Qualification (e.g. CEng MIMechE) (if any)																
<input type="checkbox"/>	Required	Certified True Copy of Applicant's Scheme "A" Training Completion Certificate																
<input type="checkbox"/>	Required	Current Organization Tree																
<input type="checkbox"/>	Required	Supporting documents for Language Test Results (if any)																
<input type="checkbox"/>		Completed and signed Payment Form																
<input type="checkbox"/>	Required	Training and Experience Report (submit in duplicate) <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 20px;"></td> <td>Training and Experience Report</td> </tr> <tr> <td></td> <td>Drawings and Documents as supporting information:</td> </tr> <tr> <td style="width: 20px;"></td> <td>Supporting Information for Project #1</td> </tr> <tr> <td></td> <td>Supporting Information for Project #2</td> </tr> <tr> <td></td> <td>Supporting Information for Project #3</td> </tr> <tr> <td></td> <td>Supporting Information for Project #4</td> </tr> <tr> <td></td> <td>Any technical publication (e.g. Conference Paper) written by Applicant (if any)</td> </tr> <tr> <td></td> <td>Any other significant information (e.g. Award, Patent, etc.) mentioned in the Report (if any)</td> </tr> </table>		Training and Experience Report		Drawings and Documents as supporting information:		Supporting Information for Project #1		Supporting Information for Project #2		Supporting Information for Project #3		Supporting Information for Project #4		Any technical publication (e.g. Conference Paper) written by Applicant (if any)		Any other significant information (e.g. Award, Patent, etc.) mentioned in the Report (if any)
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	Any other significant information (e.g. Award, Patent, etc.) mentioned in the Report (if any)																	
<input type="checkbox"/>	Required	CPD Record																
<input type="checkbox"/>	-	Original copy of the HKIE Scheme "A" Training Logbook																

#### 5. Checklist of Documents for General Experience Route of MHKIE (MCL)

##### Application

✓	<b>Certified by 1 Supporter</b>	<b>Documents</b>																
<input type="checkbox"/>	Required	Filled Application Form 1/MD, <b>with 4 supporters' signature</b>																
<input type="checkbox"/>	Required	Certified True Copy of Applicant's Bachelor Degree certificate																
<input type="checkbox"/>	Required	Certified True Copy of Applicant's Master Degree certificate (if any)																
<input type="checkbox"/>	Required	Certified True Copy of Applicant's Professional Qualification (e.g. CEng MIMechE) (if any)																
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## Appendix 2 Relevant Mechanical Engineering Experiences to fulfill HKIE(MCL) Competence Requirements

### (A) Mechanical Engineering Consultant Experiences to fulfill HKIE Competence Requirements

<i>HKIE Competence Requirements</i>	<i>Relevant Mechanical Engineering Consultant Experiences</i>
<b>Applying Mechanical Engineering Knowledge (C1, C2, C11)</b>	
C1. Comprehend and apply knowledge of accepted principles underpinning widely applied good practice for professional engineering;	<ul style="list-style-type: none"> <li>- Apply professional knowledge and skills in mechanical engineering, such as fluid dynamics principles to determine the pressure requirement for a hydraulic system, thermodynamics principles to determine the heating or cooling system, affinity laws for fans/pumps, mechanical principles related to vibration or acoustic control, material selection related to different mechanical properties requirement, etc. to design, implement, operate and maintain systems or conduct incident investigations;</li> <li>- Provide professional advice on mechanical engineering for cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, lift and escalator, control and monitoring system, etc.</li> </ul>
C2. Comprehend and apply knowledge of accepted principles underpinning good practice for professional engineering that is specific to Hong Kong; and	<ul style="list-style-type: none"> <li>- Understand and familiar with statutory requirements from local authorities (e.g. ASD, BD, DSD, EMSD, EPD, FSD, LD, WSD, etc.), with regard to ordinances, regulations or code of practice, etc.;</li> <li>- Apply professional knowledge and skills in mechanical engineering, in accordance with statutory requirements, to the design,</li> </ul>

<i>HKIE Competence Requirements</i>	<i>Relevant Mechanical Engineering Consultant Experiences</i>
	implementation, operation and maintenance, investigation of incidents or provision of professional advice on mechanical engineering for cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, lift and escalator, control and monitoring system, etc. in accordance with statutory requirements.
C11. Maintain the currency of his or her professional engineering knowledge and skills.	- Organize and attend related CPD activities in accordance with HKIE CPD requirements.
<b>Developing Technical Solution (C3 and C4)</b>	
C3. Define, investigate and analyze complex engineering problems in accordance with good practice for professional engineering; and	<ul style="list-style-type: none"> <li>- Identify a complex engineering problem, the constraints (e.g., space constraint), and the technical requirements (e.g., design criteria and/or design parameters) for a mechanical engineering system;</li> <li>- During the analysis, consider the design, manufacture, construction, installation, operation, maintenance, or repair of the mechanical engineering system;</li> <li>- Investigate infrequently encountered complex engineering problems without precedent reference of solutions; and be responsible to resolve the problems with originality in the analysis.</li> </ul>
C4. Design or develop solutions to complex engineering problems in accordance with good practice for professional engineering.	- Design or develop solutions for cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, lift and escalator, control and monitoring system, etc.

<i>HKIE Competence Requirements</i>	<i>Relevant Mechanical Engineering Consultant Experiences</i>
	to meet the defined requirements and objectives.
<b>Managing Engineering Work (C5, C6, C7 and C12)</b>	
C5. Be responsible for making decisions on part or all of one or more complex engineering activities;	<ul style="list-style-type: none"> <li>- Be responsible for the management of new installation and/or maintenance of cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, lift and escalator, control and monitoring system, etc.;</li> <li>- Manage the use of diverse resources including people, money, equipment, materials and technologies;</li> <li>- Participate the resolution of critical problems arising from interactions among wide-ranging technical, engineering and other issues;</li> <li>- Prepare tender document and conduct tender assessment for a project with the consideration of fee, technical aspect, programme, manpower, etc.</li> </ul>
C6. Manage part or all of one or more complex engineering activities in accordance with good engineering management practice;	<ul style="list-style-type: none"> <li>- Supervise the design and/or construction work of cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, lift and escalator, control and monitoring system, etc. and Inspect the quality of the work; and deal with any problems that arise.</li> </ul>
C7. Identify, assess and manage engineering risk; and	<ul style="list-style-type: none"> <li>- Conduct risk assessment and manage the risks associated with the design, installation, repair, maintenance and overhaul of the cooling</li> </ul>

<i>HKIE Competence Requirements</i>	<i>Relevant Mechanical Engineering Consultant Experiences</i>
	system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, lift and escalator, control and monitoring system, etc.
C12. Exercise sound professional engineering judgement.	- Be responsible for engineering activities requiring judgement in technical, quality, manpower, financial, safety, environment aspects.
<b>Upkeeping Professional Acumen (C8, C9 and C10)</b>	
C8. Conduct engineering activities to an ethical standard prescribed by the HKIE;	- Understand and familiarize with HKIE ethical standard and show how to apply them in projects.
C9. Recognize the reasonably foreseeable social, cultural, health, safety, sustainability and environmental effects of professional engineering activities generally; and	- Involve themselves in the application of energy-saving systems, the development of schemes with reference to climate change, activities related to health and safety regulations, etc.
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.	- Demonstrate the effective communication skills with workers, engineers, stakeholders and public related to design, implementation, operation and maintenance, incidents investigation and providing professional advice on mechanical engineering for cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, lift and escalator, control and monitoring system, etc.

**(B) Mechanical Engineering Contractor Experiences to fulfill HKIE Competence Requirements**

<i>HKIE Competence Requirements</i>	<i>Relevant Engineering Contractor Experiences</i>
<b>Applying Mechanical Engineering Knowledge (C1, C2, C11)</b>	
<p>C1. Comprehend and apply knowledge of accepted principles underpinning widely applied good practice for professional engineering;</p>	<p>- Apply appropriate mechanical engineering knowledge and skills to:</p> <p>(i) Develop detail design submissions, including drawings, calculations, method statement, fabrication or manufacturing process, etc., to justify the viability of the design to fulfill specified requirements, including but not limited to system or competent performance, in-situ feasibilities to install and commissioning of cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, control and monitoring system, etc.; <u>or</u></p> <p>(ii) Prepare and conduct system or component failure incident investigation reports, which cover root cause(s) analysis and respective engineering improvement or rectification suggestions with substantiations, for cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, control and monitoring system, etc.; <u>or</u></p> <p>(iii) Provide engineering design and professional advice to improve of any existing engineering design or system in enhancing constructability, operability, maintainability, reliability or operation efficiency of cooling system, heating system, ventilation system, piping system, air compressor system,</p>



<b><i>HKIE Competence Requirements</i></b>	<b><i>Relevant Engineering Contractor Experiences</i></b>
	<p>mounting system, hoisting system, control and monitoring system, etc.,</p>
<p>C2. Comprehend and apply knowledge of accepted principles underpinning good practice for professional engineering that is specific to Hong Kong; and</p>	<p>- Understand and familiarize with statutory requirements such as Factories and Industrial Undertakings Ordinance (Cap. 59) and other ordinances, regulations and code of practices for project experiences in C1;</p>
<p>C11. Maintain the currency of his or her professional engineering knowledge and skills.</p>	<p>- Organize and attend related CPD activities in accordance with HKIE CPD requirements.</p>
<b>Developing Technical Solution (C3 and C4)</b>	
<p>C3. Define, investigate and analyse complex engineering problems in accordance with good practice for professional engineering; and</p>	<p>- Investigate infrequently encountered complex engineering problems without precedent reference of solutions for cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, control and monitoring system, etc.; and be responsible to resolve the problems with originality in analysis by applying professional knowledge and skills in mechanical engineering and good engineering practices</p> <p>- Develop engineering investigation plans and procedures to simulate or generate the problems and collect, organize, analysis relevant information to identify the root cause(s) of complex engineering problem.</p>
<p>C4. Design or develop solutions to complex engineering problems in accordance with good practice for professional engineering.</p>	<p>- Make use of the analysis results from above and apply relevant mechanical engineering knowledge and skills, and good engineering practices to plan and supervise the</p>

<i>HKIE Competence Requirements</i>	<i>Relevant Engineering Contractor Experiences</i>
	<p>development and implementation of solution(s) for cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, control and monitoring system, etc., to address the root causes.</p> <ul style="list-style-type: none"> <li>- Develop engineering solutions shall cover, but not limited to, necessary engineering design details, appropriate manufacturing information, necessary construction and installation methodologies, and system commissioning plan and procedures:                             <ul style="list-style-type: none"> <li>(i) for any new engineering system, plant or installation; <u>or</u></li> <li>(ii) for repairing, reinstating, alternation and improvement of any existing engineering system, plant or installation.</li> </ul> </li> </ul>
<b>Managing Engineering Work (C5, C6, C7 and C12)</b>	
<p>C5. Be responsible for making decisions on part or all of one or more complex engineering activities;</p>	<ul style="list-style-type: none"> <li>- Be responsible for the management of new installations and/or modification and/or maintenance of cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, control and monitoring system, etc.</li> <li>- Manage the use of diverse resources including people, money, equipment, materials and technologies;</li> <li>- Participate the resolution of critical problems arising from interactions among wide-ranging technical, engineering and other issues;</li> </ul>

<i>HKIE Competence Requirements</i>	<i>Relevant Engineering Contractor Experiences</i>
	<ul style="list-style-type: none"> <li>- Develop methodology statement and coordinated with various interfacing parties for infrequently encountered complex engineering activities.</li> </ul>
<p>C6. Manage part or all of one or more complex engineering activities in accordance with good engineering management practice;</p>	<ul style="list-style-type: none"> <li>- Supervise the construction works of cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, control and monitoring system, etc. and inspect the quality of the work and to deal with any problems that arise.</li> <li>- Carry out extraordinary and emergency maintenance work on cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, control and monitoring system, etc.</li> </ul>
<p>C7. Identify, assess and manage engineering risk; and</p>	<ul style="list-style-type: none"> <li>- Conduct risk assessment and manage the risks associated with the installation, repair, maintenance and overhaul of the cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, control and monitoring system, etc.</li> </ul>
<p>C12. Exercise sound professional engineering judgement.</p>	<ul style="list-style-type: none"> <li>- Be responsible for engineering activities requiring judgement in technical, quality, manpower, financial, safety, environment aspects.</li> </ul>
<b>Upkeeping Professional Acumen (C8, C9 and C10)</b>	
<p>C8. Conduct engineering activities to an ethical standard prescribed by the HKIE;</p>	<ul style="list-style-type: none"> <li>- Understand and familiar with HKIE ethical standard and show how to apply them in projects.</li> </ul>

<i>HKIE Competence Requirements</i>	<i>Relevant Engineering Contractor Experiences</i>
<p>C9. Recognize the reasonably foreseeable social, cultural, health, safety, sustainability and environmental effects of professional engineering activities generally;</p>	<p>- Involve in the application of energy saving systems, development of schemes with reference to climate change, activities related to health and safety regulations, etc.</p>
<p>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.</p>	<p>- Demonstrate the effective communication skills with workers, engineers, stakeholders and public related to design, implementation, operation and maintenance , incidents investigation and providing professional advice on mechanical engineering for cooling system, heating system, ventilation system, piping system, air compressor system, mounting system, hoisting system, control and monitoring system, etc.</p>

**(C) Facility Management of Mechanical Engineering System Experiences to fulfill HKIE Competence Requirements**

<i>HKIE Competence Requirements</i>	<i>Relevant Facility Management of Mechanical Engineering System Experiences</i>
<b>Applying Mechanical Engineering Knowledge (C1, C2, C11)</b>	
<p>C1. Comprehend and apply knowledge of accepted principles underpinning widely applied good practice for professional engineering;</p>	<ul style="list-style-type: none"> <li>- Apply professional knowledge and skills in mechanical engineering, such as establishing comprehensive maintenance plan, conducting repairing work, replacement of key building equipment, alternation and addition work of building to design, implement, operate and maintain or investigate incidents;</li>   <li>- Provide professional advice on mechanical engineering for maintenance plan, repair work, replacement of key building equipment and alternation and addition work of building.</li> </ul>
<p>C2. Comprehend and apply knowledge of accepted principles underpinning good practice for professional engineering that is specific to Hong Kong; and</p>	<ul style="list-style-type: none"> <li>- Understand and familiar with statutory requirements of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations (Cap. 59J), statutory requirements stipulated in related ordinances, regulations and code of practices from local authorities including Fire Services Department and Building Department;</li>   <li>- Apply professional knowledge and skills in mechanical engineering, in accordance with Cap. 59J, to design, implement, operate and maintain, investigate incidents or provide professional advice on mechanical engineering maintenance plan, repair work, replacement of key building equipment and alternation and addition work of building.</li> </ul>

<i>HKIE Competence Requirements</i>	<i>Relevant Facility Management of Mechanical Engineering System Experiences</i>
C11. Maintain the currency of his or her professional engineering knowledge and skills.	<ul style="list-style-type: none"> <li>- Organize and attend related CPD activities in accordance with HKIE CPD requirements.</li> </ul>
<b>Developing Technical Solution (C3 and C4)</b>	
C3. Define, investigate and analyze complex engineering problems in accordance with good practice for professional engineering; and	<ul style="list-style-type: none"> <li>- Plan and supervise the development, manufacture, construction, installation, operation, maintenance or repair of the chiller plant, pumping plant, filtration plant, lift &amp; escalator system, hoisting equipment, etc.;</li> <li>- Investigate infrequently encountered complex engineering problems without precedent reference of solutions and be responsible to resolve the problems with originality in analysis.</li> </ul>
C4. Design or develop solutions to complex engineering problems in accordance with good practice for professional engineering.	<ul style="list-style-type: none"> <li>- Design or develop solutions for chiller plant, pumping plant, filtration plant, lift &amp; escalator system, hoisting equipment, etc. systems to meet the defined requirements and objectives.</li> </ul>
<b>Managing Engineering Work (C5, C6, C7 and C12)</b>	
C5. Be responsible for making decisions on part or all of one or more complex engineering activities;	<ul style="list-style-type: none"> <li>- Be responsible for the management of new installation and/or maintenance of the chiller plant, pumping plant, filtration plant, lift &amp; escalator system, hoisting equipment, etc.;</li> <li>- Manage the use of diverse resources including people, money, equipment, materials and technologies;</li> <li>- Participate the resolution of critical problems arising from interactions between wide-</li> </ul>

<i>HKIE Competence Requirements</i>	<i>Relevant Facility Management of Mechanical Engineering System Experiences</i>
	ranging technical, engineering and other issues.
C6. Manage part or all of one or more complex engineering activities in accordance with good engineering management practice;	<ul style="list-style-type: none"> <li>- Supervise the installation chiller plant, pumping plant, filtration plant, lift &amp; escalator system, hoisting equipment, etc. and inspect the quality of the work and to deal with any problems that arise;</li> <li>- Carry out extraordinary and emergency maintenance work on chiller plant, pumping plant, filtration plant, lift &amp; escalator system, hoisting equipment, etc.</li> </ul>
C7. Identify, assess and manage engineering risk; and	<ul style="list-style-type: none"> <li>- Conduct risk assessment and manage the risks associated with the installation, repair, maintenance and overhaul of the chiller plant, pumping plant, filtration plant, lift &amp; escalator system, hoisting equipment, etc.</li> </ul>
C12. Exercise sound professional engineering judgement.	<ul style="list-style-type: none"> <li>- Be responsible for engineering activities requiring judgement in technical, manpower, financial, safety, environment aspects.</li> </ul>
<b>Upkeeping Professional Acumen (C8, C9 and C10)</b>	
C8. Conduct engineering activities to an ethical standard prescribed by the HKIE;	<ul style="list-style-type: none"> <li>- Understand and familiar with HKIE ethical standard and show how to apply them in projects.</li> </ul>
C9. Recognise the reasonably foreseeable social, cultural, health, safety, sustainability and environmental effects of professional engineering activities generally; and	<ul style="list-style-type: none"> <li>- Respond to emergency breakdowns and ensure health and safety regulations are met and produce risk assessment reports and legal and insurance documents.</li> </ul>

<i>HKIE Competence Requirements</i>	<i>Relevant Facility Management of Mechanical Engineering System Experiences</i>
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.	- Demonstrate the effective communication skills with workers, engineers, stakeholders and public related to design, implementation, operation and maintenance, incidents investigation and providing professional advice on mechanical engineering systems.



**(D) Mechanical Engineering Research Experiences to fulfil HKIE Competence Requirements**

<i>HKIE Competence Requirements</i>	<i>Relevant Mechanical Engineering Research Experiences</i>
<b>Applying Mechanical Engineering Knowledge (C1, C2, C11)</b>	
C1. Comprehend and apply knowledge of accepted principles underpinning widely applied good practice for professional engineering;	- Apply professional knowledge and skills in mechanical engineering, such as solid mechanics to analyze structure integrity, material consideration, dynamic and kinematic or control for system operation, mechanics for thermofluid process operation, etc., to design, implement, operate and maintain or research projects.
C2. Comprehend and apply knowledge of accepted principles underpinning good practice for professional engineering that is specific to Hong Kong; and	- Understand and familiar with statutory requirements, relevant local code of practice, regulations and related ordinances;  - Apply professional knowledge and skills in mechanical engineering to design, implement, operate and maintain, investigate research experiment tools or provide professional advice on mechanical systems for processing and control for research project.
C11. Maintain the currency of his or her professional engineering knowledge and skills.	- Organize and attend related CPD activities in accordance with HKIE CPD requirements.
<b>Developing Technical Solution (C3 and C4)</b>	
C3. Define, investigate and analyse complex engineering problems in accordance with good practice for professional engineering; and	- Plan and supervise the development, manufacture, construction, installation, operation, maintenance or repair of systems for research projects;  - Investigate infrequently encountered complex engineering problems without precedent

<i>HKIE Competence Requirements</i>	<i>Relevant Mechanical Engineering Research Experiences</i>
	reference of solutions and be responsible to resolve the problems with originality in analysis.
C4. Design or develop solutions to complex engineering problems in accordance with good practice for professional engineering.	- Design or develop solutions for new installations of the systems to achieve and to meet the defined research requirements and objectives.
<b>Managing Engineering Work (C5, C6, C7 and C12)</b>	
C5. Be responsible for making decisions on part or all of one or more complex engineering activities;	<ul style="list-style-type: none"> <li>- Be responsible for the management of the systems of research projects;</li> <li>- Manage the use of diverse resources including people, money, equipment, materials and technologies;</li> <li>- Participate the resolution of critical problems arising from interactions between wide-ranging technical, engineering and other issues.</li> </ul>
C6. Manage part or all of one or more complex engineering activities in accordance with good engineering management practice;	- Supervise the installation of the systems for research projects and inspect the quality of the work and to deal with any problems that arise.
C7. Identify, assess and manage engineering risk; and	- Conduct risk assessment and manage the risks associated with the installation, maintenance and operation of the systems for research projects.
C12. Exercise sound professional engineering judgement.	- Be responsible for engineering research activities requiring judgement in technical,

<i>HKIE Competence Requirements</i>	<i>Relevant Mechanical Engineering Research Experiences</i>
	manpower, financial, safety, environment aspects.
<b>Upkeeping Professional Acumen (C8, C9 and C10)</b>	
C8. Conduct engineering activities to an ethical standard prescribed by the HKIE;	- Understand and familiar with HKIE ethical standard and show how to apply them in projects.
C9. Recognise the reasonably foreseeable social, cultural, health, safety, sustainability and environmental effects of professional engineering activities generally; and	- Respond to emergency breakdowns and ensure health and safety regulations are met and produce risk assessment reports and legal and insurance documents.
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.	- Demonstrate the effective communication skills with researchers, technical professionals and public related to design, implementation, operation and maintenance and providing professional advice on mechanical, process and control system for research project execution.

## Appendix 3 – Exemplars on Training and Experience Report for Applying Mechanical Engineering Knowledge, Developing Technical Solutions and Managing Engineering Work

### Exemplar 1 – MHKIE Applicant with Mechanical Engineering Consultant Experiences

#### Background

<b>i. Periods of Training and Experience</b>			
i. Chronological order, giving inclusive dates in months and years			
ii. As details of duties can be found in application form, they may not be repeated in this report.			
<b>Training</b>			
<b>From</b>	<b>To</b>	<b>Company</b>	<b>Position</b>
1/2015	12/2016	The Engineering Consultant Company	Graduate Trainee
		<b>Projects/Duties</b>	
		Assist the Engineer to prepare the mechanical system design for [n] nos. of engineering projects.	
<b>Sub Total : (Months/Years)</b>		2 years	
<b>Professional Experience</b>			
<b>From</b>	<b>To</b>	<b>Company</b>	<b>Position</b>
1/2017	12/2017	The Engineering Consultant Company	Assistant Engineer
1/2018	12/2020	The Engineering Consultant Company	Engineer
		<b>Projects/Duties</b>	
		Prepare the engineering design for mechanical engineering [system name] system for [project name] with total area [area] m <sup>2</sup> in [location] serving [n] population.  (Consultant Fee: HKD [cost]M or Construction Cost: HKD [cost]M)	
		Liaised with client, contractors, government officials, etc. and managed the construction programme and the budget plan for [project name], managed the project team with [n] members.	

		(Consultant Fee: HKD [cost]M or Construction Cost: HKD [cost]M)	
<b>Sub Total (Months/Years)</b>		4 years	
<b>Total (Months/Years)</b>		6 years	

## ii. Professional Experiences

- i. state the Applicant's precise positions have occupied in each case and describe clearly the degree of the Applicant's *responsibility* assigned; use the first person (I, me, my) to show Applicant's personal contribution;
- ii. indicate the *size and cost* of the works; keep in about 3 – 4 projects or works demonstrating all competences;
- iii. elaborate on any particular *problems* encountered and how the Applicant arrived at viable solutions with consideration of *options or alternatives*;
- iv. provide evidence to demonstrate the competences (At most four relevant competences should be quoted at a time)
- v. provide evidence or examples of recent work to support their claim of attaining professional status, such as reports, plans, calculations, photographs, etc. as appropriate

Applying Mechanical Engineering Knowledge	Competence
<p><b>Project Title:</b> Construction of [name] underground street in [location]  <b>Position and Project Brief:</b> Engineer in charge of Mechanical Ventilation System Design for the [l] m-long underground street serving [n] population.</p> <p>(Consultant Fee: HKD [cost]M or Construction Cost: HKD [cost]M)</p> <p><b>Professional Experiences</b>                      I was the Engineer in charge of the Mechanical Ventilation System Design for the [l] m-long underground street in [location] serving [n] population. This Mechanical Ventilation System was designed to provide air ventilation and smoke extraction for the Underground Street. This Mechanical Engineering Ventilation design was complex as the underground street was</p>	C1, C2

<p>developed in several phases. Additional consideration was given to the life-time performance and the interfacing issues during the interim stages.</p> <p>I firstly prepared the design for smoke extraction and proposed a layout with [n] fans distributed in [n] ductworks to meet the requirement in the Fire Engineering Report. I determined the fan capacity and the minimum smoke extraction rate for this system to ensure that each smoke zone could extract smoke at [l] m<sup>3</sup>/s with a make-up air velocity lower than [l] m/s. This design also could meet the requirement stipulated in Building Department Fire Safety Code, the smoke extraction requirement in the Fire Services Department Code of Practice for Minimum Fire Service Installations, the air quality requirement in associated with Environmental Impact Assessment (EIA) Report, etc. Then, I applied the Darcy Weisbach equation to determine the pressure loss due to friction along the ductwork and tunnel. I also determined the pressure loss through various fittings and equipment of the Mechanical Ventilation System. This Mechanical Ventilation System design was accepted by the client.</p>	
<p><b>Maintain Engineering Knowledge</b></p> <p>I joined and attended seminars, factory visits, group discussions organized by the HKIE, the Institution of Mechanical Engineers (IMechE), etc. to upkeep my technical knowledge, project management skills, etc. Through direct discussion with experts in different fields, I obtained the up-to-date technical knowledge of building services engineering industry.</p> <p>Moreover, I obtained in-depth knowledge of the structure and working principles, design code, etc. through my professional experiences on projects. I also developed my knowledge of material science related to design of the Heating, Ventilation, and Air Conditioning (HVAC) and drainage system etc.</p>	C11
<p><b>Developing Technical Solutions</b></p>	<p><b>Competence</b></p>
<p><b>Project Title:</b> Construction of [system name] in [location]  <b>Position:</b> Engineer in charge to prepare the HVAC system design  <b>Project Brief:</b> Drainage system for [project name] project with total area [area]m<sup>2</sup> in [location] serving [n] population.</p> <p>(Consultant Fee: HKD [cost]M or Construction Cost: HKD [cost]M)</p>	

<p><b>Professional Experiences</b></p> <p>I was the Engineer in charge of the drainage system design for the [project name] with a total area of [area]m<sup>2</sup> in [location] serving [n] population.</p> <p>The drainage system design was complex as the project involved a large roof surface area (i.e. [area] m<sup>2</sup>) which made it difficult to fulfill the statutory requirement stipulated in Cap123i Building Regulation and client's expectations. To resolve this engineering problem, I applied the Manning Equation to determine the pipework dimension for a conventional gravity system with a 3 m/s flow velocity, which would be [length]mm. The [length]mm drainage pipes were too large and not acceptable by the client.</p> <p>Hence, I recommended using a siphonic rainwater system to balance the diverse needs. I prepared the pipework layout of this siphonic rainwater system and then carried out the hydraulic calculation by applying the Darcy Weisbach equation. I found out that using siphonic rainwater system could reduce the pipe size and fall gradient with [n] times better performance. My proposal to use s siphonic rainwater system was accepted by the client and approved by the Building Department.</p>	<p>C3, C4</p>
<p><b>Managing Engineering Work</b></p>	<p><b>Competence</b></p>
<p><b>Project Title:</b> Upgrading of HVAC system for [name] Building</p> <p><b>Position and Project Brief:</b> Project engineer to manage and supervise the construction activities associated with the upgrading of HVAC system for [name] Building</p> <p>(Consultant Fee: HKD [cost]M or Construction Cost: HKD [cost]M)</p> <p><b>Professional Experiences</b></p> <p>When I seconded to a mechanical sub-contractor company, I was the project engineer responsible for managing the upgrading of HVAC system for [name] Building. I managed the budget plan, project programme,</p>	<p>C5, C6</p>

<p>manpower arrangement, etc. I adopted “MS Project” to identify the critical paths of different construction activities, e.g. submission date, ordering, delivery, Testing and Commissioning (T&amp;C), etc. For the budget plan, I carefully reviewed the quotations of different mechanical equipment and chose the mechanical equipment with acceptable quality and a competitive price. Besides, when I planned for the manpower arrangement, I estimated the required man-hours of the key tasks with the aid of records of previous completed projects to ensure that my manpower arrangement was feasible and the works could be completed in a timely manner.</p>	C12
<p>In the detailed design stage, I conducted risk assessments and managed the risk associated with the implementation of upgrading the HVAC system with careful consideration of opportunities and consequences of potential incidents according to designed piping systems, possible installation sequence, and method of equipment and pipework.</p>	C7



## Exemplar 2 – MHKIE Applicant with Mechanical Engineering Contractor Experiences

### Background

<b>i. Periods of Training and Experience</b>			
i. Chronological order, giving inclusive dates in months and years			
ii. As details of duties can be found in application form, they may not be repeated in this report.			
<b>Training</b>			
<b>From</b>	<b>To</b>	<b>Company</b>	<b>Position</b>
1/2015	12/2016	An Engineering Consultant Company	Graduate Trainee
		<b>Projects/Duties</b>	
		Assist the Engineer to prepare the mechanical system design for [n] nos. of engineering projects.	
<b>Sub Total : (Months/Years)</b>		2 years	
<b>Professional Experience</b>			
<b>From</b>	<b>To</b>	<b>Company</b>	<b>Position</b>
1/2017	12/2017	An Engineering Consultant Company	Assistant Engineer
1/2018	12/2020	An Engineering Consultant Company	Engineer
		<b>Projects/Duties</b>	
		Prepare the engineering design for [name] Sewage Treatment Works Upgrading Project  (Contract Sum: HKD [cost]M or Construction Cost: HKD [cost]M)	
		Liased with client, contractors, government officials, etc. and managed the construction programme and the budget plan for [name] projects, Managed the project team with [n] members  (Contract Sum: HKD [cost]M or	

		Construction Cost: HKD [ <i>cost</i> ]M)	
<b>Sub Total (Months/Years)</b>		4 years	
<b>Total (Months/Years)</b>		6 years	

Applying Mechanical Engineering Knowledge	Competence
<p><b>Project Title:</b> Upgrading of [<i>name</i>] Sewage Treatment Works Project</p> <p><b>Position:</b> Engineer in charge to prepare the pumping and pipework design</p> <p><b>Project Brief:</b> Pumping and Pipework System for transferring different working fluid involved in the [<i>name</i>]sewage treatment plant with handling capacity [<i>n</i>] Minimal Liquid Discharge (MLD)</p> <p>(Contract Sum: HKD [<i>cost</i>]M or Construction Cost: HKD [<i>cost</i>]M)</p> <p><b>Professional Experiences</b></p> <p>I was the Engineer in charge of the pumping and pipework system design for the [<i>name</i>] sewage treatment plant with handling capacity [<i>n</i>]MLD.</p> <p>The pumping and pipework system was designed to transfer fluid to different process tanks in the sewage treatment process. Taking cost, safety and reliability into consideration, I developed an overall pipework layout design with the aid of Piping and Instrumentation Diagram. Then I applied Darcy Weisbach Equation and carried out the hydraulic and headloss calculations to determine the pipework dimension and required head.</p> <p>With consideration of statutory requirements of Factories and Industrial Undertaking Ordinance (Cap. 59), I designed the installation methods of the pumping and pipework system.</p>	C1 & C2
<p><b>Maintain Engineering Knowledge</b></p> <p>I joined and attended seminars, factory visits, group discussions organized by the HKIE, the Institution of Mechanical Engineers (IMechE), etc. to upkeep my technical knowledge, project management skills, etc. Through the direct discussion with experts in different fields, I obtained up-to-date technical knowledge of the sewage treatment</p>	C11

<p>process and relevant technology.</p> <p>Moreover, I obtained my in-depth knowledge of the treatment process control through my professional experiences on projects. I also developed my knowledge of material science related to mechanical system design of treatment facilities, etc.</p>	
<p><b>Developing Technical Solutions</b></p>	<p><b>Competence</b></p>
<p><b>Project Title:</b> Upgrading of [name] Sewage Treatment Works Project  <b>Position:</b> Engineer in charge of Deodorization System Design  <b>Project Brief:</b> To design a deodorization (DO) system design for [name] sewage treatment works with handling capacity [n] MLD in remote area.</p> <p>(Contract Sum: HKD [cost]M or Construction Cost: HKD [cost]M)</p> <p><b>Professional Experiences</b></p> <p>I was responsible for deodorization system design for [name] sewage treatment works. The DO system was designed to extract foul air from process tanks with three air change per hour (ACH).</p> <p>Following the Piping and Instrumentation Diagram, I conducted the design calculation and prepared the layout of mechanical equipment. I applied my knowledge of fluid dynamics when I carried out the design calculation to determine the required fan capacity and pipework dimension.</p> <p>For the type and dimension of filter system, I was responsible to investigate the solution of filter system which was without precedent reference of solutions. I noted that the sewage treatment works had very limited site area available and located in remote area; hence, the design of filter should be optimized to meet the operation needs of this site. I identified the concentration and amount of Hydrogen Sulfide (H<sub>2</sub>S) in different process stages carefully to ensure the deodorization system could remove the H<sub>2</sub>S gas to a level that met the discharge requirement and managed the risk associated with H<sub>2</sub>S gas accumulation. I evaluated the pros and cons of different deodorization technologies and determined to use both biotrickling filters and activated carbon filters for this plant. I</p>	<p>C3, C4</p>

<p>recommended that the provision of dehumidifier could provide the foul air with 85% relative humidity and hence a suitable environment for activated carbon media. My design proposal was laminar flow in the air duct with a velocity &lt; 10m/s and at least &lt; 0.4 m/s for DO tank contact time. The design recommendation for this deodorization system was agreed upon by DSD.</p>	
<p><b>Managing Engineering Work</b></p>	<p><b>Competence</b></p>
<p><b>Project Title:</b> Maintenance Contract of Sewage Handling Facilities in [location] area</p> <p><b>Position and Project Brief:</b> Project engineer to manage and supervise the maintenance activities</p> <p>(Contract Sum: HKD[<i>cost</i>]M or Construction Cost: HKD [<i>cost</i>]M)</p> <p><b>Professional Experiences</b></p> <p>I was responsible for managing the contract of providing maintenance service to sewage handling facilities in [location] area. I led [<i>n</i>] workers to complete [<i>n</i>] overhaul works under my supervision. I managed the budget plan and project programme to ensure [<i>name</i>] maintenance works could be completed on schedule. For the budget management, I carefully examined the needs and chose suitable mechanical parts with the most competitive price for the maintenance and overhaul works to save on material costs. For the project programme management, I prepared a Gantt Chart to identify the critical path of each overhaul. I also prepared the work plan, labour arrangement plan, contingency plan for each overhaul to ensure that the works could be completed in a timely manner.</p> <p><b>Project Title:</b> Upgrading of [<i>name</i>]Sewage Treatment Works</p> <p><b>Position and Project Brief:</b> Engineer in charge of implementing the pumping and pipework system of [<i>name</i>] sewage treatment works with handling capacity [<i>n</i>] MLD.</p> <p>(Contract Sum: HKD[<i>cost</i>]M or Construction Cost: HKD[<i>cost</i>]M)</p> <p><b>Professional Experiences</b></p> <p>I was the Engineer in charge of implementing of the pumping and pipework systems of [<i>name</i>] sewage treatment works. I led [<i>n</i>] workers to</p>	<p>C5,C6</p>

<p>install the [<i>n</i>] pumps and [<i>length</i>] m-long pipework for the [<i>name</i>] sewage treatment works. Before the commissioning test, I checked the pump alignment and if the pumps could be properly operated. I confirmed that no abnormal vibration or noise was heard in the pump operation. During the commissioning test, I verified that the pump could be properly operated at different motor speeds. I also checked the hydraulic calculation and pumping sizing to verify if they were in line with the actual performance. Hence, with my engineering judgement, I concluded that the performance of pumps was satisfactory.</p>	C12
<p>I conducted risk assessments and managed the risk associated with the implementation of the pumping and pipework systems with careful consideration of opportunities and consequences of potential incidents according to work statements and the sequence of installing the pumps and pipework.</p>	C7

### Exemplar 3 – MHKIE Applicant with Mechanical System Operation and Maintenance Experiences

#### Background

<b>i. Periods of Training and Experience</b>			
i. Chronological order, giving inclusive dates in months and years			
ii. As details of duties can be found in application form, they may not be repeated in this report.			
<b>Training</b>			
<b>From</b>	<b>To</b>	<b>Company</b>	<b>Position</b>
1/2015	12/2016	An Engineering Company	Graduate Trainee
		<b>Projects/Duties</b>	
		Assist the Engineer to prepare the Heating, Ventilation, and Air Conditioning (HVAC) system replacement proposal and carry out the routine maintenance and projects.	
<b>Sub Total : (Months/Years)</b>		2 years	
<b>Professional Experience</b>			
<b>From</b>	<b>To</b>	<b>Company</b>	<b>Position</b>
1/2017	12/2017	An Engineering Company	Assistant Engineer
1/2018	12/2020	An Engineering Company	Engineer
		<b>Projects/Duties</b>	
		Prepare the engineering proposal for installation of new HVAC system and upgrading of existing HVAC system	
		Liaised with client, sub-contractors, technicians, etc. and managed the project programme and budget plan for [n] projects and maintenance contracts. Managed the project team with [n] members.	
<b>Sub Total (Months/Years)</b>		4 years	
<b>Total (Months/Years)</b>		6 years	

Applying Mechanical Engineering Knowledge	Competence
<p><b>Project Title:</b> New Chiller System for [name] building</p> <p><b>Position:</b> Engineer in charge to design and install the new chiller system for [name] building</p> <p><b>Project Brief:</b> Design of new chiller system to replace the existing chilled water system</p> <p>(Contract Sum: HKD [cost]M or Construction Cost: HKD [cost]M)</p> <p><b>Professional Experiences</b></p> <p>I was the Engineer in charge of design a new chiller plant system to replace the existing chilled plant for [name] Building. In this project, I carried out the pumping and pipework system design for the new chilled water system, and I also took the opportunity to enhance the energy efficiency of the chiller plant.</p> <p><u>Design of a chilled water pumping and pipework system</u></p> <p>Following the requirements of Building Energy Code on maximum velocity and pressure drop of water, I applied the Darcy Weisbach Formula and Colebrook Equation and carried out the hydraulic calculation to determine the hydraulic pressure loss by considering the system critical path and flow rate. The design was approved by the client.</p> <p><u>Enhancement of energy efficiency of a chiller plant system</u></p> <p>To evaluate the existing chiller plant performance, I studied the power consumption, cooling capacities, and combined chiller operation in different scenarios under full or various part loading situations. Then I applied the pressure-enthalpy diagram to analyze the energy saving opportunities by adjusting the setting of the chilled water supply temperature. I analyzed the relationship between different cooling load demands against different set point to determine the optimized chiller operation sequencing and chilled water set points. My recommendation could reduce the annual electricity consumption by [n]%. With reference to Building Energy Efficiency Ordinance, this design was also approved by the client.</p>	<p>C1,C2</p>

<p><b>Maintain Engineering Knowledge</b></p> <p>I joined and attended seminars, factory visits, group discussions organized by the HKIE, the Institution of Mechanical Engineers (IMechE), etc. to maintain my technical knowledge, project management skills, etc. Through the direct discussion with experts in different fields, I obtained the up-to-date technical knowledge of building services engineering and relevant technology.</p>	<p>C11</p>
<p><b>Developing Technical Solutions</b></p>	<p><b>Competence</b></p>
<p><b>Project Title:</b> Replacement Proposal of Chiller in [name] Building  <b>Position:</b> Engineer in charge of Replacement Proposal of Chiller in [name] Building  <b>Project Brief:</b> To provide a solution to the chiller replacement proposals meeting the conflicting needs of different parties</p> <p>(Contract Sum: HKD [cost]M or Construction Cost: HKD [cost]M)</p> <p><b>Professional Experiences</b></p> <p>I was responsible for the replacement proposal of chiller plants in the [name] building. I identified that this replacement proposal for a chiller was a complex engineering problem as there were conflicting needs from different groups, e.g. site constraints, provision of cooling capacities during the replacement works, cost-effective consideration and energy efficiency concerns.</p> <p>I firstly reviewed the existing chiller system cooling load profile and on-site measurement data. Then I found that the existing chiller plants had been operated for more than 20 years and had degraded, which resulted in easier breakdown and more energy consumption, i.e., the efficiency had already been reduced by [n]%. Considering the site constraints, I exercised my engineering judgement to prepare a tailor made replacement proposal for this chiller plant.</p> <p>I applied my knowledge in Thermodynamics to carry out an in-depth energy saving analysis including the part-load efficiency analysis. I ensured that my proposed chiller system complied to the minimum COP requirement of Building Energy Efficiency Ordinance and achieved</p>	<p>C3, C4</p>



<p>enhanced energy saving. I also calculated the annual energy consumption for different chiller selections and combinations with various cooling capacities of variable speed drive (VSD) or constant speed water-cooled chillers or air-cooled chillers. Then, I compared the energy usage for each chiller system with the past cooling load demand and determined that the most efficient option would be [n] VSD water cooling chillers. Compared with the existing system, my proposal option could reduce [n]% of electricity usage with 8-year payback period.</p> <p>For this replacement proposal, I also suggested a solution to the provision of cooling loads during the replacement works. Understanding that the cooling load of the building was provided by two separated chiller systems in round-the-clock operation, I proposed installing a heat exchanger system to connect the chilled water system such that the chilled water could be provided to both areas.</p> <p>The clients also accepted my comprehensive chiller system replacement proposal.</p>	
<p><b>Managing Engineering Work</b></p>	<p><b>Competence</b></p>
<p><b>Project Title:</b> Maintenance Contracts and Projects for Chiller Plants  <b>Position and Project Brief:</b> Project engineer to manage and supervise the maintenance activities associated with chiller plants under the maintenance contracts.</p> <p>(Contract Sum: HKD [cost]M or Construction Cost: HKD [cost]M)</p> <p><b>Professional Experiences</b></p> <p>I was responsible for managing [n] maintenance contracts and projects for [n] chiller plants. I led my maintenance team with [n] people, including engineers, site supervisors, technicians and sub-contractors, to carry out the routine maintenance and projects. I managed the labour and material cost for each maintenance contract to ensure the overall cost would be within budget and on schedule. For complicated maintenance works, I prepared a Gantt Chart to identify the critical path. I also provided clear work instructions to technicians and sub-contractors to ensure the work would be completed on time. To achieve better</p>	<p>C5,C6</p>

coordination between different parties, I organized weekly site meetings with sub-contractors to monitor the work progress and discussed the safety issues.

Safety is one of the most common engineering risks associated with maintenance contracts. When I managed the maintenance contracts, I worked closely with the in-house safety officers to minimize the risk at the site. I carefully reviewed the job nature of different maintenance contracts and developed a specific checklist of safety instructions for site work. I also closely monitored the workers to ensure that the work could comply with company's safety instructions and relevant safety ordinances under the Labour Department. If any risk and the unsafe condition was found in the work sites, I would immediately stop the work and report it to the company. In the weekly site meeting, I conducted a briefing on the safety issues associated with the upcoming works i.e. working on high levels and hoisting, for my engineering team and sub-contractors.

**Project Title:** Chiller Replacement Proposal for [name] Building

**Position and Project Brief:** Engineer in charge of implementing the chiller replacement proposal for [name] Building

(Contract Sum: HKD [cost]M or Construction Cost: HKD [cost]M)

**Professional Experiences**

I was the Engineer in charge of implementing the chiller replacement proposal of [name]building.

Given the chiller plant was round-the clock operation, I led [n] workers to replace the air-cooled chiller with a water-cooled chiller for [name] Building. Understanding that the chilled water supply should be provided continuously, I applied the hop tapping method to tee-off the branch pipe for new chillers to maintain the chilled water supply during the project. With my engineering judgement, I confirmed that the implementation of chiller replacement proposal for [name] Building was successfully completed without affecting the normal operation of [name] Building.

C7

C12

