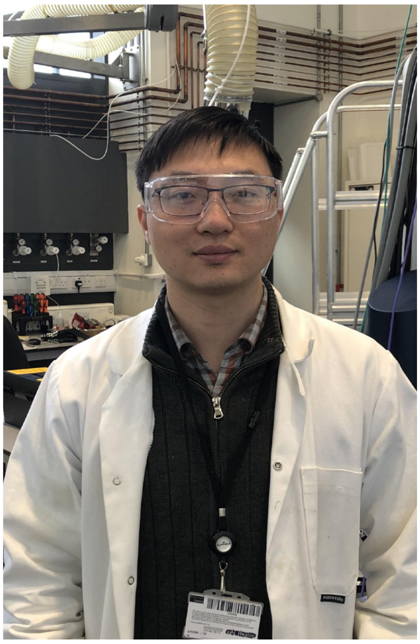
IChemE

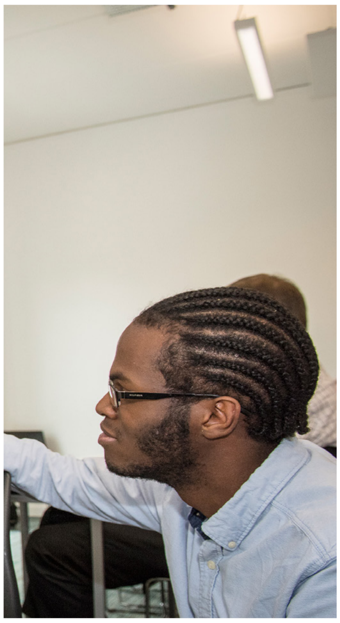
Chartered Member

Information and guidance for applicants









Contents

1 Introduction

1.1 Who is this information and guidance for?

This document contains information and guidance for people who either:

- consider that they are ready to apply for Chartered Member, as either a Chartered Chemical Engineer or a Professional Process Safety Engineer, meaning that they believe they can demonstrate that they meet the standard required, and want to find out how to do so; or
- are unsure whether they are ready to apply.

In both cases we strongly advise you to read this document as it explains:

- what it means to become a Chartered Member;
- the standard that applicants must meet for their application to be successful;
- the application process;
- what you need to do and provide relevant examples; and
- what we will do.

After reading the guidance you should reach one of the following conclusions.

Your conclusion	What you should do
You think you are ready to apply.	Please do so through our membership application portal.
You have questions about the standard or the application process.	Please contact us. Not only can we help you, but it helps us improve the guidance. Our membership helpdesk can be contacted by telephone on +44 (0)1788 578214 or by email at applications@icheme.org
You want help with deciding whether you are ready to apply.	We strongly advise you to seek the help of a mentor. Having a mentor is useful at any stage of your career, but in this context a mentor can help you prepare for your Chartered Member application. You can find a mentor either through your employer, the local IChemE area network (at membergroups@icheme.org), or our Mentor Match service.

Note that the contents of this document apply to both Chartered Chemical Engineer and to Professional Process Safety Engineer unless otherwise stated.

1.2 What it means to be a Chartered Member

Chartered Membership of IChemE shows that you have demonstrated, through a peer-review process, your professional competence and commitment as a chemical or professional process safety engineer to employers, policy makers, regulators and society. It allows you to use the postnominal designation MIChemE. As a Chartered Member you will also be entitled to refer to yourself as either a Chartered Chemical Engineer (CME) or a Professional Process Safety Engineer. These titles represent the highest level of recognition in chemical and process engineering and can only be gained through IChemE.

You can also apply for external professional registrations through IChemE either alongside your application for Chartered Member or later, if appropriate. This provides valuable external validation of your competence and commitment to the profession. You can apply for registration as a **Chartered Engineer (CEng)** or a **Registered Professional Engineer of Queensland (RPEQ)** if you are applying for Chartered Member as a Chemical Engineer. If you are applying for Chartered Member as a Professional Process Safety Engineer, you can apply for registration as a CEng. See **Appendix A** for further details.

What is competence?

Competence is the ability to carry out a task to an effective standard.

Its achievement requires the right level of knowledge, understanding and skill, as well as a professional attitude.

What is commitment?

Commitment refers to a set of values, rules of conduct, and obligations to maintain and enhance the reputation of the engineering profession and the individual.

As an IChemE member you agree to abide by our **Code of Professional Conduct**, which underpins the importance of professionalism and ethical behaviour among all our members. We recommend that you read this before you apply. The code includes an acceptance by members of the Institution's requirements for the review of Continuing Professional Development (CPD); you can read more about our CPD requirements **here**.

All members pay an annual subscription based on their membership grade and location. You can find out more about subscriptions **here**. Chartered Members get access to our membership resources as part of their subscription, details of which you can find **here**.

1.3 Our standard

To become a Chartered Member, you will need to demonstrate that you meet the required standard for either Chemical Engineer or for Professional Process Safety Engineer. Each standard covers the following five areas of competence and commitment; areas A to D, relate to 'competence'; area E relates to 'commitment'. Note that these are expressed differently for Chartered Chemical Engineer and Professional Process Safety Engineer, although in both cases these five areas are covered.

A. Knowledge and understanding.
B. Design, development and solving engineering problems.
C. Responsibility, management and leadership.
D. Communication and interpersonal skills.
E. Professional commitment.

We will ask you to explain what you have done and what you have achieved in your career. You will need to show that you can develop solutions to complex engineering problems using new or existing technologies, and through innovation, creativity and technical analysis, and that your academic knowledge is at master's level or equivalent.

IChemE welcomes a wide range of Chemical Engineers and Professional Process Safety Engineers. You might be working either as a technical specialist or a project manager, for example. Equally, you might be an academic in one of these or a closely related area.

You should not begin your application until you have assured yourself that you fully understand the standards you will be required to demonstrate. If you have any concerns about whether you will be able to meet the IChemE's standard you should discuss your situation with a mentor. You can find a mentor either through your employer, the local IChemE area network, or our **Mentor Match service**.

The standards for Chemical Engineers and Professional Process Safety Engineers are derived from and meet the competence and commitment requirements for Chartered Engineers as set out in ***The United Kingdom Standard for Professional Engineering Competence* (UK-SPEC)**. UK-SPEC is published by the Engineering Council, the UK's regulatory authority for professional engineers and technicians. It was developed collaboratively with a range of individuals and organisations representing the breadth of the engineering profession, including industry and academia. UK-SPEC provides a framework for assessment, describes the requirements to be met and gives examples of how to do so.

1.4 The application process

All assessments are carried out by Chartered Members of the Institution who volunteer and are trained for their roles. All applications will be made online but for now please use the templates provided to prepare. All assessments in the Professional Review are made by Chartered Members of the Institution who volunteer and are trained for their roles. All applications will be made online but for now please use the templates provided to prepare.

The assessment comprises the following two stages:

Review of Underpinning Knowledge and Understanding

We will assess whether you have the knowledge and understanding on which professional competence and commitment are built. You might be able to demonstrate this by virtue of having accredited qualifications or combinations of qualifications but, if not, we provide other ways for you to demonstrate it.

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Review of Competence and Commitment

We will review how you have applied your knowledge and understanding, how you have gained experience and developed competence and commitment and assess whether your competence and commitment are at the level that meet the standard. This involves an assessment of your application paperwork and a Professional Review Interview.

Your application and the Professional Review comprise the steps shown in Figure 1. Not all applicants are required to complete the steps shown in a lighter colour and with a dashed line around them.

Please note that you will need to pay an application fee.

Data protection

By applying to IChemE, you agree to IChemE taking the appropriate steps to process your application in accordance with our processes and regulatory requirements. You should not disclose confidential information that is contrary to your employer's confidentiality policy. The professional reviewers understand that the reports that they submit may be reviewed by various committees/panels within IChemE (Membership and Qualifications Committee, and their subcommittees) and that the Engineering Council and other appropriate licensing bodies may audit any aspect of an application that relates to the appropriate registration. For more information about data protection, please visit www.icheme.org/legal

Confidentiality

Our reviewers need to understand your work and the engineering challenges involved and at certain stages of the application you will need to be specific about your current and past roles and what you do or did. It is important, however, that you do not disclose confidential information contrary to your employer's confidentiality policy in any part of your application or in any of the documents you provide (your CV, for example). Note that all reviewers are bound by IChemE's Code of Professional Conduct and the Data Protection Act 2018.

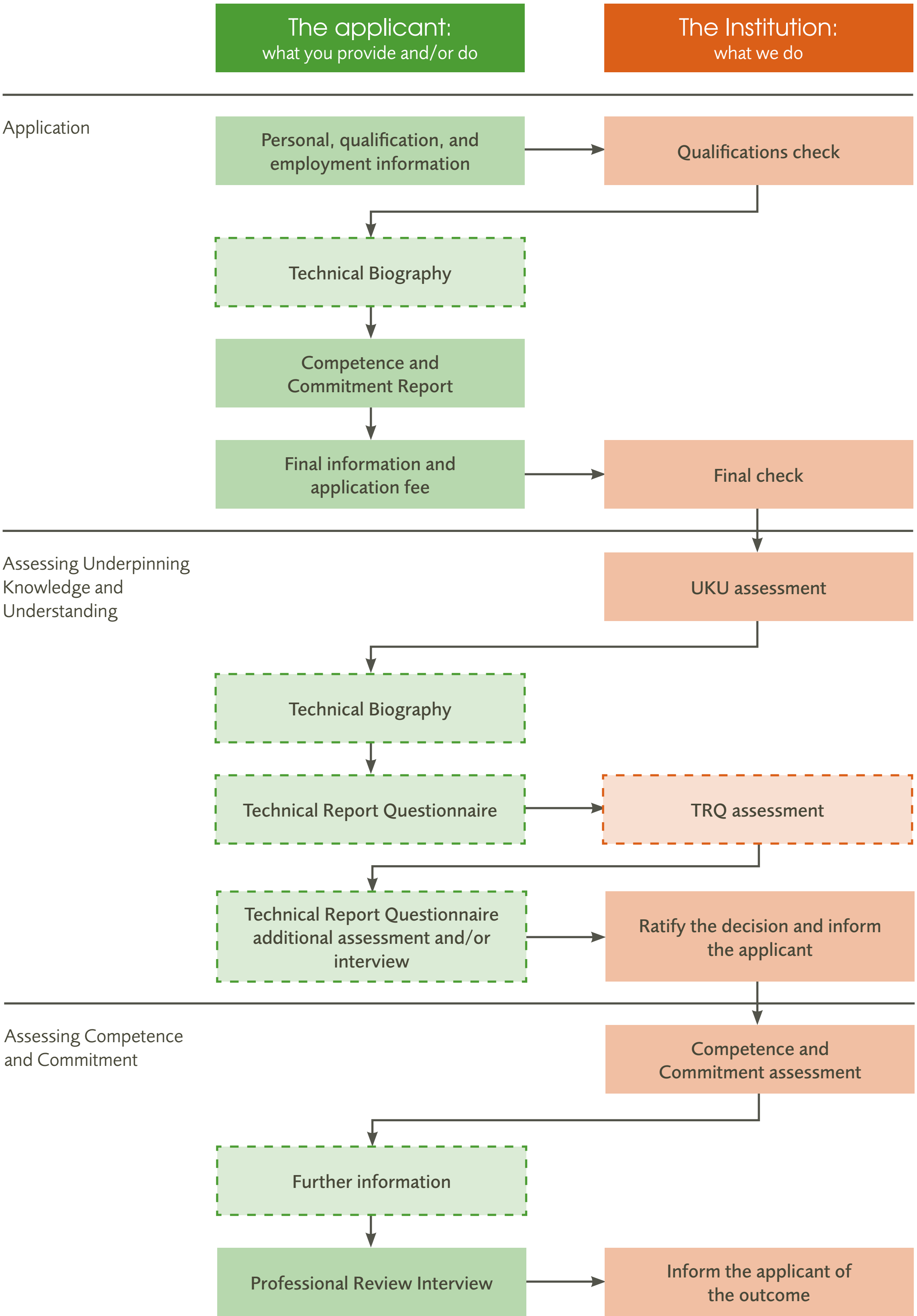
Conflicts of interest

IChemE's Code of Professional Conduct states that members must avoid real or perceived conflicts of interest and advise affected parties when such conflicts arise. Where a professional reviewer indicates conflict of interest, IChemE membership staff will work to make alternative arrangements. You are also asked to inform staff immediately, upon receipt of the details of your professional reviewers if you think that there could be a conflict of interest.

Appeals

If you have evidence that you have been treated unfairly or that any part of the application process was not carried out properly you may use IChemE's appeal process. See Appendix B for further details.

Figure 1: Steps in the application and Professional Review Process



2 Making your application

2.1 General information

Once live, you can apply online through our membership application portal. In the meantime, please use the templates provided on our website to prepare your application.

Personal, qualification, and employment information

You should provide the details we ask about you, your qualifications, and your employment. At this stage we will ask you for the following:

Personal information	First and last names Date of birth Home address, phone number, and email address
Qualification information	University(ies) Degree programme title(s), and start and end date(s) Copies of certificates (see below) Transcripts may be required
Employment information	Organisation name(s) and address(es) Job title(s) Employment dates CV (to be uploaded)

Qualification certificates

You will need to provide us with copies of your academic qualification certificates: please do **not** send original certificates. If your certificate has a hologram, you can either photograph it or scan it. If your certificate does **not** have a hologram, you must scan it.

Photographs of certificates should show all edges of the original document; any watermarks, holograms, or stamps should be clearly visible and legible.

Scanned certificates must be certified as a 'true copy' by a person who is not related to you, nor living at the same address, nor in a relationship with you. The person could be:

- a senior member of your employing company;
- a professionally qualified member of an Engineering Council licensed Professional Engineering Institution eg IChemE, ICE, IMechE etc;
- a university lecturer;
- a solicitor; or
- a professionally qualified member of a Washington Accord signatory.

To certify your certificate, you should photocopy it and show both the photocopy and the original to the person certifying. They must:

- write "Certified to be a true copy of the original seen by me" on the document;
- sign and date it;
- print their name under the signature; and
- add their employing organisation plus position, or Professional Engineering Institution plus membership grade and number, and their email address and contact telephone number.

View an example of a certified certificate

Scans, once certified, and photographs must be uploaded to your membership application portal account. If your certificates are not available in English, you may be required to provide a translation.

We reserve the right to contact the person who certifies your certificate(s) or the university/college awarding the certificate.

2.2 Underpinning Knowledge and Understanding

To qualify as a Chartered Member, you will need to demonstrate that you have an appropriate level of knowledge and understanding in either chemical engineering or process safety engineering. This knowledge and understanding is the essential foundation on which professional competence is developed and is referred to as Underpinning Knowledge and Understanding (UKU).

UKU can be acquired by academic study and/or in-employment training, and/or professional experience. At this stage of the application process, we will carry out a check to see whether your academic qualifications fulfil our UKU requirements.

Your qualifications

You will fully satisfy the UKU requirements for Chartered Member if your qualifications or combination of qualifications are listed under one of the following:

For Chartered Chemical Engineer, either:	For Professional Process Safety Engineer, either:
a. A programme accredited by the IChemE on behalf of the Engineering Council for the purposes of fully meeting the academic requirement for registration as a Chartered Engineer (CEng); b. A programme accredited by the IChemE on behalf of the Engineering Council for the purposes of demonstrating in part the knowledge and understanding required for registration as a Chartered Engineer (CEng) plus an accredited programme on behalf of the Engineering Council as meeting the requirements for further learning for registration as a Chartered Engineer (CEng); or c. A combination of qualifications and experience assessed by the IChemE to be equivalent to the above.	a. A programme accredited by the IChemE on behalf of the Engineering Council for the purposes of fully meeting the academic requirement for registration as a Chartered Engineer (CEng); b. A programme accredited by the IChemE on behalf of the Engineering Council for the purposes of demonstrating in part the knowledge and understanding required for registration as a Chartered Engineer (CEng) plus an accredited programme on behalf of the Engineering Council as meeting the requirements for further learning for registration as a chartered Engineer (CEng); c. A programme in engineering or technology accredited by a professional engineering institution behalf of the Engineering Council for the purposes of demonstrating in part the knowledge and understanding required for registration as a Chartered Engineer (CEng), plus either a programme accredited by the IChemE on behalf of the Engineering Council as meeting the requirements for further learning for PPSE registration or appropriate equivalent further learning examined to an equivalent level via the Institution's Individual Case Procedure; or d. A combination of qualifications and experience assessed by the IChemE to be equivalent to the above.

If you meet the UKU requirements for Chartered Chemical Engineer or for Professional Process Safety Engineer, as set out above, you will also satisfy the UKU requirements for registration with the Engineering Council as a Chartered Engineer.

An accredited qualification is one that has been assessed and found to meet, or partially meet, specific criteria. Those criteria are primarily in the form of the learning outcomes contained in our accreditation guidance documents. By meeting these criteria, the qualification is judged to provide the holder with the UKU on which professional competence and commitment can be built. Accreditation of a qualification is awarded for specific intake years, these being the year in which the particular programme of study began. For your qualification to be accredited your intake year must be one of those specified.

What is further learning?

Where a qualification/programme partially delivers the Underpinning Knowledge, Understanding and Skills and/or some of the competence required for a professional title it is described as either:

- requiring further learning; or
- is further learning.

Checking your qualifications

- You can use the **Engineering Council's** Course Search database to find our if your qualification is accredited. It lists the qualifications accredited by the UK professional engineering institutions that are licenced to do accredit by the Engineering Council. It includes qualifications at some education institutions outside the UK. You might find this video helpful as it explains how to use the Engineering Council search facility, If you need further assistance, please contact applications@icheme.org;
- **The International Engineering Alliance's** (IEA) qualifications checker. The IEA oversees international agreements which govern the recognition of engineering educational qualifications; or
- **Engineers Europe's** database. Engineers Europe unites national engineering associations from 33 European Higher Education Area countries. They facilitate the mutual recognition of engineering qualifications in Europe.

Whether you check in advance or simply provide details of your qualifications during your application, we will check your qualification and let you know the outcome. The outcome will be either:

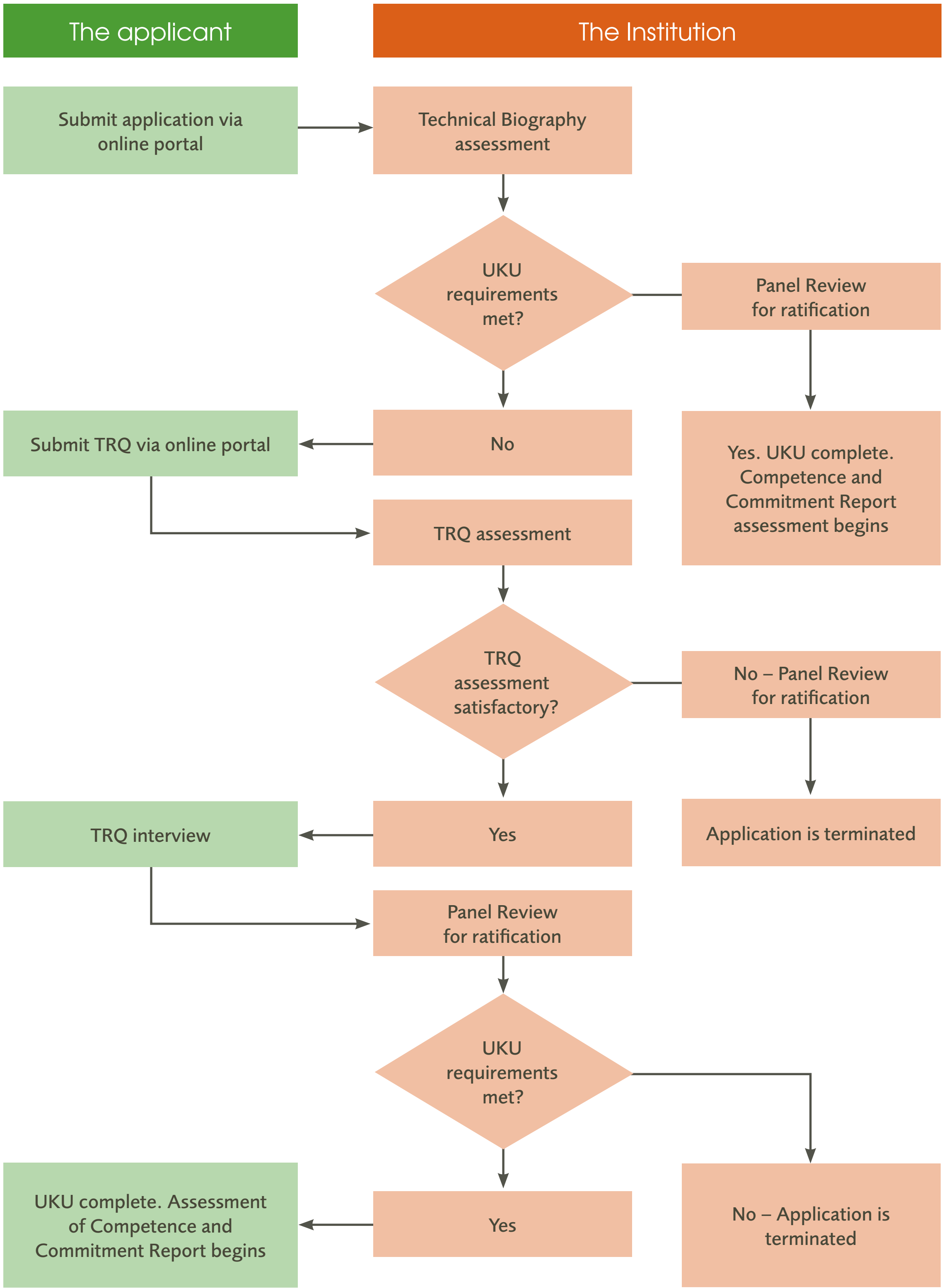
Your qualifications	What this means	What you should do next
Meet the requirements	You will **not** have to complete a Technical Biography.	Complete the Competence and Commitment Report, see 2.4 (page 12).
Do **not** meet the requirements	You will need to complete a Technical Biography, see 2.3 below before you complete a Competence and Commitment Report.	Complete the Technical Biography and then complete the Competence and Commitment Report.

2.3 Technical Biography

When we have checked your qualifications, we will tell you whether you need to complete a Technical Biography (TB). If you **do** need to complete a TB, please read this section. If you **don't** need to complete a TB, you can move directly to the next section.

The TB is designed so that you can provide a concise, structured summary of your qualifications and experience in chemical or process safety engineering. It allows you to cross-reference the technical experience that you have gained in the workplace against specific statements of requirement. In this way you can show how your experience has provided you with knowledge and understanding of chemical engineering or process safety engineering that, taken together with your qualifications, meets the UKU requirements for Chartered Member; this is equivalent to the UKU attained during study for accredited qualifications. You will need to include transcripts and certified copies of certificates, and evidence of work-based learning.

Figure 2: The UKU assessment process



You will need to provide an outline summary of your formal technical qualifications, and your knowledge and understanding of chemical engineering or process safety engineering gained through experience. The information should be succinct but detailed enough to allow the reviewers to identify areas where they need greater detail. The total word count for the technical experience section should not exceed 1000 words.

The TB requires you to cross reference your experience examples in each of the following area listed below:

For Chartered Chemical Engineer:	Professional Process Safety Engineer:
Part O – Underpinning chemical and bio sciences	Part A – Generic B-standard engineering
Part A – Fundamentals of chemical engineering	Part B – Advanced process safety engineering
Part B – Advanced chemical engineering	

Appendix C, for Chartered Chemical Engineer, and Appendix D, for Professional Process Safety Engineer, show these areas in more detail along with suggestions of the types of evidence you might provide for each.

You might not need to complete the entire TB as the following exemptions apply:

For Chartered Chemical Engineer:	Professional Process Safety Engineer:
You do **not** need to provide any evidence for **Part O** and **Part A** in the 'technical experience' if you have either of the following qualifications, as you have already fully met the requirements for these sections: ■ an IChemE accredited degree at bachelor's level; ■ a degree recognised by Engineers Europe or Washington Accord.	You do not need to provide any evidence for **Part A** if you have either of the following qualifications, as you have already fully met the requirements for this section: ■ a degree in any engineering discipline accredited by an Engineering Council licensed professional institution at either bachelor's or master's Level (including bachelor's degrees in Chemical Engineering accredited by IChemE); ■ a Chemical Engineering degree recognised under the Washington Accord on or after 01/09/1999; ■ a degree, in any discipline, recognised under the Washington Accord; ■ FEANI First Cycle degree; ■ If you wish to discuss this further with us, please contact applications@icheme.org
You do **not** need to provide any evidence for **Part B** in the 'technical experience' section if you have an IChemE accredited degree at master's level (further learning), as you have already met that requirement.	You do not need to provide any evidence for part B if you have a Process Safety degree accredited by IChemE at Masters level (further learning), as you have already fully met the requirements for this section.

Unless you are exempt, as noted above, you should cross reference your experience examples against the topics within each area within the TB. We recommend that you use the Technical Biography preparatory template to map your academic learning against the requirements; when you're ready, you can copy and paste your information from the template directly into your online application.

When completing the TB:

- write in the first-person singular: "I wrote", "I presented";
- only mention the work you have personally completed – don't include work done by others;
- list your professional skills and background clearly and concisely;
- avoid business jargon and acronyms as the reviewers may not work in the same field as you;
- explain what you have learnt from employment experience; and
- only include activities relevant to engineering; activities such as being captain of a local sports team, or hobbies should not be included.

Verifying your work-based learning

You will need to provide us with details of a person or people who can verify your worked-based learning, if required. Ideally, they should be a Chartered Engineer(s) in a position of authority. Verifiers should know enough about your work to be able to verify the evidence in your TB.

Verification is required for each section of the TB. When you have completed your TB in the application portal, you should download it and then send it to your verifier(s) together with the Technical Biography Verification Form. Ask them to complete the verification form and return it to you for you to provide with your application. Ensure that you use the final version of your TB to send to the verifiers to ensure consistency..

TB checklist

Make sure you have checked, done, or provided everything on the checklist below. Incomplete or incorrect information will delay your application:

- are you currently an IChemE member?
- have you read the guidance carefully, followed the guidelines and made sure not to exceed the word count?
- have you checked to see if your qualifications are accredited?
- have you provided a certified certificate for each qualification provided?
- have you provided an official transcript for each qualification provided? Make sure to upload these before submitting your application;
- have you contacted your verifiers and sent them a verification form along with a copy of your online TB?
- have you provided your transcript?

Now that you have completed the TB application you should move on to complete the Competence and Commitment Report. Once you have completed that there a few a steps that will complete your application, which we will explain below. Once you've completed your application we will start the assessment process.

2.4 Competence and Commitment Report

All applicants must complete a Competence and Commitment Report (C&C) as part of their application. You should submit your C&C only when you feel you are 100% ready, meaning that you consider that you can demonstrate that you meet the standard required.

You will need to complete the C&C itself and also upload:

- verification forms for the C&C;
- details of two references;
- your CV (and an IPD self-managed application form, if you have completed this already and you would like to submit it); and
- relevant photographic identification.

The C&C enables you to provide us with the information we need so that we can assess whether you meet the competence and commitment requirements for Chartered Member. This involves a review of how you have developed your competence and commitment based on the UKU you gained through your qualifications and work experience; this is sometimes referred to as your initial professional development (IPD). You may have managed your own IPD, with the support of a mentor, or you may have completed a structured Accredited Company Training Scheme (ACTS).

Professional reviewers are only able to perform their assessment based upon the evidence you provide.

You should be able to discuss the work described in the report in further depth at interview.

Completing your C&C: general advice

The C&C asks you to provide evidence of:

- how you apply your knowledge and understanding to practical situations;
- your ability to handle the wider implications of your work as an engineer;
- your interpersonal, leadership and communication skills;
- your commitment to high standards of professional and ethical conduct; and
- your Continuing Professional Development (CPD).

Please use the C&C preparatory template to help you prepare your application offline.

You must:

- **keep to the word limit**. Applications that exceed the limit may be returned for revision. For the Chartered Chemical Engineer application, your C&C must be between 3000 and 3800 words. For the Professional Process Safety Engineer application, it should be between 4200 and 4600 words, with each subsection roughly the same length;
- **emphasise your specific actions**. Focus on your responsibilities and contributions in each example. Make it clear what you did and your role in the task;
- **explain why you did what you did**. Use the Context, Action, and Result (CAR) or Situation, Target, Action, Result (STAR) approach to provide clarity. Focus on detailing your **actions** and their outcomes;
- **assign examples to the correct sections of the C&C**. Ensure your training and experience examples are placed appropriately to showcase your knowledge and competencies;
- **show how you applied chemical engineering or process safety principles**. In Section A for the Chartered application and Sections A and B for the Professional Process Safety Engineer application, demonstrate how you applied either chemical engineering or process safety principles. Be sure to explain why a chemical engineer or process safety expert was needed for the task;
- **provide one main in-depth example per subsection**. Supplement this with one or two brief examples to show breadth of experience while offering depth in your primary example;
- **be concise and clear**. Use correct, clear English. Keep your writing concise across all sections, ensuring your communication is both professional and effective;
- **use bullet points only when appropriate**. Bullet points are useful for clarifying sequences of events or listing related examples, but full sentences are required for other content;
- **minimise abbreviations and acronyms**. Either explain abbreviations/acronyms fully when they first appear or clarify them in your CV;
- **write in the first-person singular**. Clearly state your actions and contributions by writing in the first person ("I did," "I designed," etc), avoiding passive voice;
- **check for consistency**. Ensure your report aligns with your CV and there are no discrepancies between the two; and
- **use of Glossary**: you must include a glossary of terms; especially process safety has a range of technical terms which can have different meanings and applications from company to company and industry to industry. It is important that you and the assessors understand how specific terms are used in relation to your application.

You must not:

- **plagiarise the work of others**. For example, from the internet, IChemE website examples, or a colleague's application;
- **use more words than necessary**. Applications exceeding the word count will be returned for revision;
- **write in the third person (singular or plural) or passive voice**. This makes your specific role and actions unclear;
- **use words like "we" or "they"**. These can make your contribution unclear and less direct;
- **exaggerate your role or importance**. Be honest and accurate about your contributions, as you'll need to support them in your interview;
- **spend excessive time explaining the context**. Focus more on the actions you performed. The context can be found in your CV if necessary;

Plagiarism

IChemE takes plagiarism seriously. Before submitting your application, you should read IChemE's **Plagiarism statement**, which applies to existing members of all grades, and also to those in the process of applying to become members.

Use of AI

IChemE acknowledges that Artificial Intelligence (AI) tools or large language models can be appropriately and ethically used to assist in composing an application. For instance, it can aid with translation, spelling, grammar, and restructuring. However, members and aspirant members remain responsible for the coherence, relevance, originality, validity, and integrity of the content in their application, even when utilising AI tools for specific elements. All use of AI must be declared within the application. Any unethical use of AI, such as generating generic or inaccurate evidence statements that do not detail (or directly relate to) the member or aspirant member's personal experiences, will be deemed inadmissible. Please see **Plagiarism, including the Use of AI** for more details.

- **talk in generalities**. Avoid phrases like "I've been involved in many projects…" or "I have several examples…" Provide specific examples instead;
- **expect the professional reviewer to 'read between the lines'**. Be explicit about your experience and competence. Don't leave things to assumption;
- **forget to spell-check**. Proofread your application for spelling and grammatical errors before submission; or
- **have a large imbalance in the length of each subsection**. Ensure that each subsection is roughly the same length, maintaining balance throughout the report.

At the beginning of the C&C briefly explain how your current or previous roles demonstrate your position of responsibility. A position of responsibility does not necessarily involve formally leading or managing others, or budget holding, although you may have these responsibilities in roles you hold or have held. A position of responsibility is one in which you have a level of self-direction and autonomy about how you perform your work and that you are individually responsible for the technical consequences of your own work and technical judgements. It is expected that you will normally be managed by others and that your work will be subject to appropriate checks and approvals.

You should describe, for one or more roles, those attributes which demonstrate your personal responsibility and accountability for your work. Should you have them, you can include responsibilities such as checking or approving work of others, coaching/mentoring others, supervisory and budget holding duties.

We recommend that you ask a mentor to review your C&C before you submit it. To find a mentor you can contact your employer or the IChemE local area network (at membergroups@icheme.org), or use our Mentor Match service.

Completing your C&C: section by section guidance

Specific guidance on each section of the C&C is included at Appendix E for Chartered Chemical Engineer, and at Appendix F for Professional Process Safety Engineer. Please read the relevant appendix.

Once you have completed the C&C you should move on to finalise your application, see below. Once you've done this, we will start to assess your application.

Verifying your C&C

As part of the application and assessment process, the experience cited in your C&C must be verified as a true account by another person. All sections of the report must be verified. IChemE reserves the right to contact your C&C verifiers.

You may provide multiple verifiers if necessary. The person(s) verifying your experience should have been:

- in a position more senior to you at the time you undertook the work referenced; and
- familiar with the work you were doing at the time.

Verifier or referee?

You must provide details of both verifiers and referees. Their roles differ: referees support your application to membership as a whole, whereas the verifier is confirming the experience you cite in your C&C. The same person can act as both your verifier and referee, providing they fulfil the requirements for each role.

They do **not** have to be:

- a member of IChemE;
- a Chartered Chemical Engineer or a Professional Process Safety Engineer;
- a chemical engineer or process safety engineer;
- the referee; or
- your current manager.

When you have completed your C&C send this to the respective verifier(s), together with the verification form, for them to complete. Once the verifiers have sent their completed verification forms back to you, you will need to upload them to your online application.

Referees

You will need two referees to support your application for Chartered Member. Your referees should ideally be current IChemE members in the grade of Chartered Member or Fellow. If you cannot find two Chartered Members or Fellows of IChemE, then it is acceptable for one of your referees to be a current member of another Professional Engineering Institution who is a Chartered Engineer (CEng) registered with the Engineering Council. They must know what level of skill, knowledge and experience is expected of a Chartered Chemical Engineer or a Professional Process Safety Engineer and be able to attest to your ability to meet the requirements for this grade of membership.

You should identify suitable/potential referees as early as possible on your path to Chartered membership and ensure as far as possible that they are and remain aware of your roles during your professional career. Typically, referees will have known you for at least a year before you submit your C&C.

Your referees must:

- be willing to provide you with a reference;
- agree to provide IChemE with information;
- not be a member of your family; and
- know your role or activities in detail, although they do not necessarily need to work with you currently.

We will ask your referees a number of questions such as:

- the length of time they have known you and in what capacity;
- whether you are employed in a responsible post in chemical engineering or process safety engineering;
- whether they would recommend your election, with brief comments to support their recommendation.

Finding a referee

If you do not know any IChemE Chartered Members or Fellows to support your application, you could try:

- contacting recent former colleagues or peers who may be Chartered Members or Fellows;
- joining your **local member group** as early as possible to create good connections with local IChemE members, one or two of whom may then be happy to provide you with a reference when the time comes;
- contacting your HR department who may hold a list of Chartered employees; or
- who is able to support your progress to membership and provide you with a suitable reference.

Your referees must complete the referee form and send it to you so you can upload as part of your application.

Curriculum Vitae

You will be asked to provide a Curriculum Vitae (CV). This should illustrate clearly your career progress, developing responsibilities and the projects/work activities referenced in your C&C. This information may be needed if the reviewers conclude that one or more areas of your C&C does not explain sufficiently how you meet a competence or commitment requirement. It can also be used to clarify any acronyms used in your C&C, helping to save word count in the C&C.

We strongly recommended that you tailor your CV to support your application. It must be an accurate and true representation of your career but should not be overly long, typically less than three pages. For data protection purposes, please remove your contact details, date of birth, and photographs from your CV before you submit it. If you do not do this, the professional reviewers will have access to this information.

Although similar to the CV used for a job application, there are stylistic differences to consider:

- write in the first person: "I wrote", "I presented" etc;
- only mention work you have completed; you should not include work done by others;
- list professional skills and background clearly and concisely;
- avoid business jargon and abbreviations/acronyms, unless explained: the professional reviewers may not work in the same field as you;
- only include activities outside of work which support your application, for example, IChemE events, or STEM/schools liaison. Do not include hobbies unrelated to engineering.

If you wish to include a list of publications or papers, this should be part of the CV rather than a separate document.

Photographic identification

Your identity must be checked at the beginning of any interview you attend either in person or via video weblink. You must, therefore, upload a scanned copy of your current passport, photographic driving licence or other recent verifiable photographic identification. We will delete this when your application process is completed.

3. Assessment of your Underpinning Knowledge and Understanding

3.1 Technical Biography

This section is relevant if you have completed the TB application. If you have, please read this section, if not please go straight to the following section.

Who will assess your TB?

Your TB will be assessed by two reviewers who have been trained for their role and the assessments they conduct are moderated to ensure that we are fair and consistent in our decisions.

What does the assessment involve?

The assessors will review the 'package of evidence' you submitted. The assessment is 'holistic', meaning that your qualifications and experience are considered together to assess whether, as a whole, they demonstrate that you meet the UKU requirements.

Outcome of the Technical Biography assessment

We will send you an email to tell you the outcome of the TB assessment; you should keep the email for future use with any IChemE application process. The assessment of your TB assessment will result in one of the following outcomes.

Outcome	What happens next?
TB shows that you meet the UKU requirements.	We will move on to assess your C&C.
TB has insufficient or incorrect information, further information required.	We will ask you to review, revise, and re-submit your TB. We will provide you with an indication of what you should do.
TB review has identified that more detailed evidence is needed to demonstrate educational base requirements.	We will ask you to submit a Technical Report Questionnaire, see below.
TB indicates other options to be considered.	We will consider other options available, depending on your circumstances, and will discuss these with you. Your application will be closed.

3.2 Technical Report Questionnaire

The Technical Report Questionnaire (TRQ) is a supplement to the TB which works to the same requirements. If, having reviewed your TB, our assessors require additional evidence to complete their evaluation of your UKU, then we will contact you to invite you to complete a TRQ. We will provide an outline of the specific TRQ sections that you are required to complete. Any sections of the TRQ which you are not specifically asked to complete are deemed to be 'met successfully' by the information you provided in your TB.

As part of the TRQ assessment, you may be required to attend a TRQ Interview. Information about the interview can be found on page 19.

Completing the TRQ

The TRQ, as a supplement to the TB, helps you demonstrate that you have the technical skills, knowledge, and learning equivalent to those attained by completing an accredited chemical engineering or process safety engineering degree programme.

When completing the TRQ, you will only complete the numbered sections identified by the reviewers. To show how you meet these criteria, you should provide details which draw from your qualifications and/or experience. If you believe that one (or more) modules in your academic qualifications meets the requirement:

- give the title of the module(s) and, if possible, the university's module code; and
- where possible, give the university's description of the module's aims (those relevant to the section), otherwise give details of what you learnt from the module relevant to the section concerned.

If you believe that you meet the requirement through professional experience:

- explain the context in which you gained the experience (eg a particular project);
- show what you have learned relevant to the specific requirement; and
- where possible, indicate how you have applied this learning to the other situations relevant to the requirement.

The focus of all your responses should be to state the technical principles you followed, and methods of calculation employed. It should:

- describe the work you completed personally, rather than the management of others to carry out tasks (where you worked as part of a team, specify what your contribution was to the overall activity);
- avoid lengthy descriptions of manufacturing processes, equipment, and the like; and
- be written in the first person, eg "I designed…", "I calculated…", "I was responsible for..." etc.

We provide a suggested word count for each section of the TRQ. However, please bear in mind that although you may need to provide a longer response in some instances, your ability to express yourself succinctly is a key professional skill. Try not to exceed the word count: any TRQ that is 10% or more over the total word count for the total sections required will be returned to you for revision.

We provide a TRQ preparatory template which you may find useful help you prepare your application. When you're ready to submit your TRQ, you can copy and paste the information from your preparatory form directly into the online application and submit it for review.

We also provide example answers for the TRQ at Appendix G.

3.3 Technical Report Questionnaire assessment

As with the TB, your TRQ will be peer-reviewed by volunteer assessors. If they determine that your TRQ provides sufficient evidence, you will enter the final stage of the process – the Technical Report Questionnaire Interview (TRQI).

3.4 Technical Report Questionnaire additional assessment

If your TRQ does not provide sufficient evidence, you will be given feedback and asked to update certain sections of your TRQ. You can do this by logging in to the application portal and updating the specified sections which will be made editable for you to do so.

3.5 Technical Report Questionnaire Interview

We may ask you to have a Technical Report Questionnaire Interview (TRQI) as part of the TRQ process. The purpose of the interview is to confirm that you meet the educational base requirements by checking that:

- the evidence presented in your TRQ is a true reflection of your experience (ie that you have carried out the activities stated); and
- you have the level of knowledge and understanding of the topic(s) covered in the TRQ to meet the threshold required.

The interview will focus on your completed TRQ. Your assessors will discuss your application with you to further explore your knowledge and understanding. All sections of the TRQ which we did **not** ask you to complete are deemed to have been 'met successfully', and so these sections will not normally be in scope for the purpose of your interview.

The TRQI is usually conducted virtually, using online teleconference facilities (Microsoft Teams or similar platform). We will set up the interview once we have confirmed a time and date with you and the reviewers. Appendix H provides detail about preparing for, joining and conducting a virtual interview. Please note, however, that at the start of a virtual interview we will verify your identity using the photographic identification you uploaded as part of your C&C submission.

Following your TRQI, the interviewers will write a report which will go to our UKU Panel for a final decision. We will email you to tell you what the outcome is; you should retain that email for future use.

Outcome

If you are successful at the interview, we will start the assessment of your C&C. If you were not successful at interview, we will tell you what options are open to you.

4. Assessment of your competence and commitment

Your C&C will be peer-reviewed by volunteer professional reviewers.

4.1 Further information

If the professional reviewers decide that your C&C requires clarification and/or expansion in one or more areas, we will email to tell you and to explain in detail what changes are required. Please take careful note of this and ensure you address each of their points, as you will only have one opportunity to revise your report. If you do not fully understand the feedback, or need additional information on the changes asked for, please contact applications@icheme.org

You will need to obtain re-verification of these revised sections. Where the original verifier is unavailable you may approach an alternative verifier, providing they fulfil the criteria listed in the verification section of this guidance. Should obtaining verification of revised sections of your C&C still prove challenging, please inform IChemE immediately and the professional reviewers will consider your case.

Where the revision is still deemed unsatisfactory, your C&C will be sent to a panel to determine the next step. The most likely outcome is that your application for Chartered Member will be closed, and you will need to re-apply. We will explain why your report was unsatisfactory and provide feedback.

4.2 Professional Review Interview

If the professional reviewers determine that your C&C provides sufficient evidence of Competence and Commitment, we will invite you for a compulsory Professional Review Interview (PRI).

Your PRI will be conducted by two professional reviewers, usually virtually or at the place of work of one of the professional reviewers. We will advise you of the location of your PRI.

Your PRI may be conducted virtually, via an online video conference (Microsoft Teams or similar). Appendix H sets out details about preparing for, joining and conducting a virtual interview.

Typically, the interview will be conducted by the same professional reviewers who assessed your C&C and therefore will have a thorough understating of your application. They will base their questions upon their assessment of your C&C. In this way they will address any gaps or areas of concern during the interview, although the interview will cover more than that.

The interview is structured yet flexible, to allow you to provide sufficient information for the professional reviewers to determine your suitability as a Chartered Member. Specifically, you must demonstrate:

- that you satisfy the competence standards of IChemE, which requires the professional reviewers to seek to verify that the contents of the C&C are an accurate reflection and true account of your training and experience;
- that you have personal commitment to CPD;
- the extent and limits of your responsibility;
- the extent of professional judgement and decision-making in your work; and
- that you will uphold the reputation and interests of IChemE.

Your interview may open with the professional reviewers asking you for a summary of your career to date, so you should consider this in your preparation.

Your C&C forms the basis of the interview. The C&C word-count restriction is such that it will contain only a summary of the work you have carried out in professional practice. The interview allows you to give a wider context to your work. The discussion will use the topics presented in the C&C and may cover each section; hence you should be prepared to discuss all the evidence set out in your report. The professional reviewers will give you the opportunity to demonstrate the depth and breadth of your experience and knowledge. On occasion, they may ask questions that range beyond what you have laid out in your C&C to allow you to give more examples. This may include information you have included in the CV you submitted as part of the application.

When describing evidence of competence at interview, you should do so with reference to the chemical engineering or process safety engineering context of the work, the actions that you undertook and the results arising from your application of chemical engineering or process safety engineering. The interview is intended to be a positive exercise, but the onus is on you to demonstrate that you satisfy the requirements.

Please bear in mind that the professional reviewers are volunteers and often have busy professional lives, therefore it is not usually possible to change the timing for the interview. Where you or one of the professional reviewers encounters extenuating circumstances, such as a bereavement, which you genuinely feel may prejudice or influence the outcome of the interview, you must inform IChemE staff immediately with a view to rescheduling the interview. If you proceed with the interview without informing us, you may not use such extenuating circumstances as grounds for appeal.

Preparation

In preparation for your interview, please re-read your C&C. You may refer to your C&C during the interview, and we recommend that you bring along a copy. However, you must not access any other material, especially via the internet, during the interview unless agreed with the professional reviewers, to show a schematic or CPD plan for example.

Where there is a trained professional reviewer within your company, we recommend that you ask them to conduct a mock Professional Review, review of you C&C and a mock PRI. This will help you to prepare for your application but does not replace the need to submit your application and progress through all stages of the Professional Review; a mock Professional Review is good practice but does not guarantee the outcome of your application. If there is not a trained professional reviewer within your company, we recommend that you seek a mentor and arrange a mock Professional Review with them in advance of submitting your application. To find a mentor we recommend that you contact your employer or the IChemE local area network (at membergroups@icheme.org), or use our Mentor Match service.

Identity check

The professional reviewers will begin the interview by welcoming you and will then perform the identity check against the photo ID you submitted with your application.

Duration

The interview will last approximately one hour. You should keep your answers brief; where the professional reviewers feel that the topic has been sufficiently covered, they may ask you to move on.

Closing the Professional Review Interview

At the end of the interview session, you will be asked if there are any items you want to mention which you feel are important to the application but were not covered by the professional reviewers. Please do not ask the professional reviewers about the outcome of your application, as the process is not yet complete.

After the interview

Immediately following the interview, and once you have left, the professional reviewers will discuss your C&C and interview and will reach an agreement on whether or not you have shown that you meet the requirements for Chartered Member. They will consider each of the competence criteria and their assessment must be evidence-based. Remember that the professional reviewers will have already reviewed you C&C and addressed any gaps or concerns through the interview. The professional reviewers are members of IChemE and bound by the Code of Professional Conduct. They must therefore conduct the assessment fairly and without bias and observe confidentiality.

The professional reviewers will submit an interview report in confidence, with their recommendation, to the relevant IChemE committee for their final decision; this is part of our standards and moderation process.

Outcome

The final decision of the committee will result in one of the following outcomes.

Outcome	What happens next?
Transfer you to Chartered Member	We will email you inform you of the outcome. In due course you will receive a confirmation letter, certificate and a membership card by post. Where you have applied for CEng registration, you will also receive a Chartered Engineer certificate directly from the Engineering Council.
Not to transfer you to Chartered Member, in which case the professional reviewers provide detailed feedback on why you do not meet IChemE's competence and commitment standards.	We will provide you with detailed feedback that will help you with your professional development. You will be welcome to reapply once you have addressed the feedback we provided; this will be treated as a new application.

Further information

If, once you have read this information and guidance document, you have any questions you can contact our membership helpdesk by:

- telephone on +44 (0)1788 578214;
- email at applications@icheme.org; or
- book a time to talk to us.

Appendix A

Registrations

Chartered Engineer

a. IChemE holds a licence with the Engineering Council which allows us to award the registrations of Engineering Technician (EngTech), Incorporated Engineer (IEng) and Chartered Engineer (CEng). When applying to become Chartered Chemical Engineer or Professional Process Safety Engineer, you may also select to apply for the additional CEng registration. An additional fee is payable, but no additional assessment steps are required, as the standards and process for Chartered Chemical Engineer and Professional Process Safety Engineer also satisfy the requirements for CEng registration. IChemE has interpreted the requirements of Engineering Council's UK SPEC standard, and ensures they are fully covered during the Professional Review. By applying to become CEng registered, you give permission for IChemE to provide the required details about you and your application to the Engineering Council, and your application may be audited by them to ensure IChemE's adherence to Engineering Council standards. Chartered Chemical Engineers and Professional Process Safety Engineers wishing to become registered as CEng at a later date should contact applications@icheme.org

Registered Professional Engineer of Queensland

b. IChemE is an approved assessment entity for Registered Professional Engineer of Queensland (RPEQ) registration. In 2002 the state of Queensland, Australia, introduced the Professional Engineers Act making it a requirement that professional engineering services in Queensland and the design of buildings, plants, machinery or products for use in Queensland are carried out by engineers who hold the status of Registered Professional Engineer of Queensland (RPEQ). The act applies extraterritorially, meaning RPEQ registration is still required for any professional engineering services performed outside Queensland or overseas but destined for Queensland, Australia. RPEQs can:

   - demonstrate the required level of qualification and competence to practise as a chemical engineer in Queensland, Australia;
   - provide critical engineering services to Queensland; and
   - be subject to a random audit of their professional development activities: audited registrants are required to demonstrate an average of 150 hours of CPD over a three-year continuous period to maintain their registration.

c. IChemE's assessment standards for Chartered Chemical Member also satisfy the requirements for RPEQ. If you think that you may require RPEQ registration in future, you are encouraged to apply for it when you apply for Chartered Chemical Engineer as retrospective requests will require an additional assessment. If you require RPEQ registration you should indicate this on your application, as IChemE must ensure that professional reviewers are themselves RPEQs.

d. IChemE provides confirmation of election as Chartered Chemical Engineer which you can then send to The Board of Professional Engineers of Queensland (BPEQ) to request the registration.

Appendix B

Appeal against a Professional Review decision

Appealing the decision

a. If you have been unsuccessful in your application for election or transfer or for registration, you may appeal on specific grounds. You must tell us that you wish to make an appeal by email at **appeals@icheme.org** so that we can send you an Appeal Form. You must then submit your appeal in writing using the IChemE Appeal Form and make payment, within two months of your being informed of the decision. Should you make an appeal but do not receive confirmation of receipt by the two-month deadline, please inform IChemE immediately, as appeals made after this cannot be considered.

Grounds for appeal

b. If your application is unsuccessful, you may make an appeal if, in your opinion:

- there were procedural errors in the handling of the application; and/or
- the Professional Review Interview was not conducted fairly.

c. The Appeals Panel will not consider any additional evidence you provide via the appeal, regarding your suitability for election or transfer. It is therefore vital that you read and follow the appropriate guidance and include all evidence you wish to be considered, as part of your application.

Appeal process

d. It is imperative that you clearly state the ground(s) for appeal and provide written evidence to demonstrate how, in your opinion, the application was not fairly assessed. One ground is sufficient to make an appeal.

e. On receipt of the appeal, it will be circulated to the members of the Appeals Panel. The panel members will also have access to all documentation relevant to the application in question including the Competence and Commitment (C&C) Report, the professional reviewer's C&C assessment report(s) and interview report and your referees' statements.

f. Members of the Appeals Panel will consider the points raised in the appeal form and examine the evidence provided. If necessary, the Chair may seek additional advice and input from non-panel members with expertise appropriate to the matters being considered. The Appeals Panel will reach a conclusion as to the validity of the appeal and the Chair will prepare a written report. If the appeal is upheld, the report will also be passed to the Registration Subcommittee.

Who considers the appeal?

g. Members of the Appeals Panel consider each appeal. The Appeals Panel is drawn from experienced professional reviewers with detailed knowledge and experience of the membership and qualification process. They do not participate in Standards Panel and Virtual Election Panel meetings and are therefore independent of the election process.

How do I submit an appeal?

h. Please contact **appeals@icheme.org**. A member of IChemE staff will provide you with more information and arrange the appeal fee payment. Where the appeal is upheld, the appeal fee is refunded. Where the appeal is not upheld, the fee is not refunded.

Timeline for appeals

i. You will be informed in writing of the decision of the Appeals Panel within two months of receipt by IChemE of both the completed appeals form and the appeal fee (whichever is received last).

Appendix C

Areas of UKU covered within the Technical Biography: Chemical Engineer

Part O – Underpinning chemical and bio sciences

Understanding of science

Your knowledge and understanding of molecular science (chemistry, biology) should be of appropriate depth and breadth to appreciate the scientific and engineering context of chemical engineering, and to support your understanding of future developments.

Part A – Fundamentals of chemical engineering

A1 – Core chemical engineering

You need to provide evidence (eg formal qualification or experiential learning) of your understanding of core chemical engineering. Core chemical engineering comprises the main principles and applications of chemical engineering, namely:

- understanding of the principles of fluids and solids formation and processing;
- proficiency in applying these principles to problems involving fluid flow, heat transfer, mass transfer and reaction engineering; and
- ability to apply principles to the analysis of complex systems within a structured approach to safety, health and sustainability.

You should give evidence of an understanding of the broad range of applications of the principles and your ability to analyse, model quantitatively and synthesise at the appropriate scale. The applications should include:

- different types of process, including continuous and batch, chemical processes and bioprocesses;
- different time scales: short and long periods, steady and unsteady state; and
- different physical scales: from molecular level to large scale continuous operations.

You should demonstrate the knowledge and ability to handle broader implications of work as a chemical engineer. These include sustainability aspects, process safety, health, environmental and other professional issues including ethics, risk, commercial and economic considerations etc.

A2 – Core chemical engineering practice

Chemical engineering practice is the practical application of chemical engineering skills, combining theory and experience, together with the use of other relevant knowledge and skills. You are required to demonstrate the ways in which chemical engineering knowledge can be applied in practice, such as in: operations and management; projects; providing services or consultancy; developing new technology.

You should demonstrate high standards of appreciation and practice of Safety, Health and Environment (SH&E) in all aspects of your work.

Typical attainments include: possession of practical and laboratory skills relevant to chemical engineering; knowledge of the characteristics of particular equipment, processes or products; the ability to deal with technical uncertainty; appreciation of the sources and value of technical literature; awareness of the nature of intellectual property; facility in the use of appropriate codes of practice and industry standards.

A3 – Chemical engineering design and design practice

Chemical engineering design is the creation of a system, process, product or plant to meet an identified need. Chemical engineering design covers a wide range of applications including process design, process troubleshooting/debottlenecking, equipment design, product design, product troubleshooting, system design.

You should provide evidence of competence in chemical engineering design, that demonstrates bringing together technical and other skills, the ability to define a problem and identify constraints, the employment of creativity and innovation, team-working and the ability to present technical information in ways appropriate to different audiences. You should demonstrate understanding of the concept of 'fit for purpose', the importance of delivery, and the need to meet ethical and legal requirements to protect safety, health and the environment.

Part B – Advanced chemical engineering

Advanced chemical engineering comprises knowledge and understanding developed to a higher level than the fundamentals of chemical engineering covered in Part A, such as what would be achieved in an accredited university master's programme. Understanding at this level is often specialised but is always characterised by the following:

- ability to handle uncertainty and complexity;
- ability to familiarise yourself with the new and unknown;
- ability to develop innovative approaches;
- understanding of the limits of available technology and of the potential of new and emerging technology; and
- a broad understanding of related subjects.

You should provide evidence of your attainment of these abilities and, in their application, your understanding and practice of:

- the principles of sustainability (environment, social and economic); and
- the need for high ethical and professional standards and how they are applied to issues facing engineers.

Your evidence should include an in-depth understanding of some area of application, alongside some understanding of the broader application of chemical engineering.

You will also need to show evidence of your ability to work beyond current knowledge and practice, such as through research, development or equivalent investigations. Similarly, you should provide evidence of your application of the advanced concepts (above) applied to chemical engineering design.

Appendix D

Areas of UKU covered within the Technical Biography: professional process safety engineer

Part A – Generic AHEP4 b-standard engineering

A1 – Design/innovation

Design is the creation and development of an economically viable product, process or system to meet a defined need. It involves significant technical and intellectual challenges commensurate with the complexity of problem to be solved. Chartered Engineers are expected to be able to apply an integrated or systems approach to the solution of complex problems.

A1.1 – Evidence of application of an integrated or systems approach to the solution of complex problems

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

A2 – The engineer and society

Engineering activity can have a significant societal impact, and engineers must operate in a responsible and ethical manner, recognise the importance of diversity, and help ensure that the benefits of innovation and progress are shared equitably and do not compromise the natural environment or deplete natural resources to the detriment of future generations.

A2.1 – Evidence of:

- identification and analysis of ethical concerns; and
- making reasoned ethical choices informed by professional codes of conduct.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

A2.2 – Evidence of use of a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

A2.3 – Evidence of adoption of a holistic and proportionate approach to the mitigation of security risks.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

A2.4 – Evidence of knowledge and application of adoption of an inclusive approach to engineering practice, recognising the responsibilities, benefits and importance of supporting equality, diversity and inclusion.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

A3 – Engineering practice

The practical application of engineering concepts and tools, engineering and project management, teamwork and communication skills. Engineers also require a sound grasp of the commercial context of their work, specifically the ways an organisation creates, delivers and captures value in economic, social, cultural or other contexts.

A3.1 – Evidence of:

- the use of practical laboratory; and
- workshop skills to investigate complex problems.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

A3.2 – Evidence of the selection and application of appropriate materials, equipment, engineering technologies and processes, recognising their limitations.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

A3.3 – Evidence of understanding the role of quality management systems and continuous improvement in the context of complex problems.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

A3.4 – Evidence of the knowledge and application of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

A3.5 – Evidence of the ability to plan and record self-learning and development as the foundation for lifelong learning/CPD.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

Part B – Advanced process safety engineering

In answering the following sections, you need to demonstrate learning at an advanced level with evidence of:

- ability to handle uncertainty and complexity;
- ability to familiarise yourself with the new and unknown;
- ability to develop innovative approaches;
- ability to communicate and influence process safety culture;
- an understanding of process safety management;
- some understanding of the limits of available technology and of the potential of new and emerging methods;
- a broad understanding of related subjects

B1 – Fundamentals and quantitative principles

Learning outcomes in this area are, effectively, the core of process safety engineering and will usually be characterised as building on and deepening the knowledge, understanding and skills already obtained from a first cycle degree or professional experience. Applicants will have developed skills associated with the application of the technical tools used to identify and assess process safety hazards, and with their strengths and weaknesses, and common errors in their use. Applicants will have a more detailed knowledge of the more technical aspects such as gas dispersion, probability estimation and consequence assessment. They will also be familiar with the development and use of risk criteria and be able to develop a logical demonstration of compliance.

B1.1 – Tools to identify and assess process safety hazards

You should provide evidence of:

- ability to identify, assess and quantify process hazards using a range of industry-standard methods with awareness of their limitations and consideration of relevant past events; and
- knowledge of risk reduction measures (and their hierarchy) in terms of process design and of prevention and mitigation techniques.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B1.2 – Incident investigation

You should provide evidence of an understanding of the basic principles of incident investigation and of identifying and implementing the lessons learned with corrective measures.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B2 – Engineering analysis

Engineering analysis involves the application of engineering concepts and tools to analyse, model and solve problems. At higher levels of study engineers will work with information that may be uncertain or incomplete. Furthermore, applicants should understand the application of relevant process safety regulations, and Process Safety Management techniques in an engineering context.

B2.1 – Understanding and application of relevant regulations

You should provide evidence of:

- an understanding of the purpose and the limitations of process safety regulations, standards, guidance and industry best practice, with some knowledge of applicable local and global legislative frameworks; and
- awareness of how the legislative framework is applied to the management of safety, health and environment in the workplace, from the perspectives of all involved.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B2.2 – Process Safety Management (PSM)

You should provide evidence of an understanding of the purpose, elements implementation and audit of a Process Safety Management System.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B3 – Design and innovation

Applicants must display competence in process safety engineering aspects of design, including an ability to evaluate or assess hazards that have occurred or could potentially occur. To meet the learning outcomes, the applicant should, for example, demonstrate an understanding of the key aspects of a hazard evaluation study throughout a project life cycle, with an ability to address the complexity issues arising from the interaction and integration of the different parts of a process or system.

B3.1 – Understanding and application of relevant regulations

You should provide evidence of an understanding of:

- understanding of the concepts of inherently safer process design, including the advantages and disadvantages of typical approaches such as risk- and code/standard-based; and
- understanding of the benefits of multiple barriers and knowledge of typical process examples.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B3.2 – Emergency planning

You should provide evidence of an understanding of:

- awareness of the regulatory requirements pertaining to the protection of people during major accidents;
- ability to identify the key aspects of on-site and off-site emergency response planning, including procedures, communications, training, testing, roles and responsibilities; and
- understanding of how to define emergency actions for hazards identified.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B4 – The engineer and society

Engineering activity can have a significant societal impact and engineers must operate in a responsible and ethical manner, recognise the importance of diversity, and help ensure that the benefits of innovation and progress are shared equitably and do not compromise the natural environment or deplete natural resources to the detriment of future generations. In relation to sustainability, applicants will be able to evaluate the environmental and societal impact of solutions to complex problems (to include the entire life cycle of a product or process) and minimise adverse impacts.

B4.1 – Protection of society and the environment

You should provide evidence of knowledge and understanding to apply process safety principles in order to address public concerns and reduce societal and environmental risk.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B4.2 – Human factors

You should provide evidence of:

- an understanding of the key human factors affecting process safety, such as ergonomic design and human performance, and how these can be actively managed to reduce risk; and
- knowledge of change management and safety-critical communications.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B4.3 – Safety culture

You should provide evidence of an understanding of the meaning and importance of safety culture and the use of appropriate models for its assessment and improvement;

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B4.4 – Leadership

You should provide evidence of an understanding of the role of leadership and organisational factors in promoting and sustaining good process safety management

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 150–250 words.

B5 – Engineering practice

Applicants must understand the ways in which process safety engineering knowledge can be applied in practice, such as in: operations and management; projects; providing services or consultancy; developing new technology. Typical learning outcomes include an in depth understanding of the identification, assessment, elimination, minimisation, prevention control and mitigation of potential process hazards.

Applicants will be able to apply an integrated approach to process safety and environmental protection, typically through significant project work.

You should provide evidence of:

- understanding of typical factors that contribute to barrier effectiveness and the role of critical activities;
- critical analysis of incidents, their causes and consequences from specific examples and making recommendations to prevent reoccurrence;
- describing the main elements of a management system to ensure potential hazards can be adequately controlled and managed;
- application of process safety management methods and originality in dealing with uncertainty, new concepts and/or applications; and
- communicating the outcomes of the work in a professional manner such as a technical report; publication; poster; presentation.

B5.1 – Engineering practice

You should provide evidence of attainment of advanced process safety engineering practice in its broadest sense according to the criteria given above. This may be done using an example of a major project, a combination of projects, industrial report, or dissertation you have undertaken.

Provide details such as module descriptors (with learning outcomes and level) for qualifications and/or experiential understanding gained through work roles or projects. Use 300–500 words.

Appendix E

Completing your C&C: Chartered Chemical Engineer – section by section guidance

Section A – Evidence of applying your knowledge and understanding to practical situations

Provide evidence of your ability to apply chemical and related engineering knowledge and understanding of engineering or science to practical chemical engineering situations.

The examples provided must involve and you should describe the use of chemical engineering principles and knowledge at an appropriate level of complexity and difficulty. Some inclusion of other knowledge, in disciplines related to chemical engineering can be appropriate, but the focus should be on demonstrating your chemical engineering knowledge and understanding. Having an awareness of methodologies, the use of standard formulae or data entry into standard spreadsheets of other models, without an apparent understanding of the underlying chemical engineering principles, does not demonstrate adequate experience. Examples involving the use of modelling tools are generally expected to refer to how results were validated.

Where possible, you should not use the same example more than once within Section A, although it is reasonable to use different examples from the same project or task.

You may consider examples of chemical engineering principles which include, but are not limited to, the following:

- laws of conservation;
- fluid dynamics;
- thermodynamics;
- mathematical modelling;
- economic evaluation;
- understanding of process technologies;
- understanding of underlying chemistry;
- systemic approach to safety and sustainability in process design;
- systemic approach to the engineering analysis of systems.

We recommend for each subsection in Section A that you provide two examples or a single complex example which involves more than one chemical engineering principle. Provision of more than two examples is likely to limit the word count available to you to provide sufficient detail elsewhere in the report. Additionally, consider if you need to support your evidence with one or two brief examples to show breadth. Examples which do not contain sufficient chemical engineering related evidence are unlikely to be accepted.

A1 – Applying appropriate theoretical and practical methods to identify or define a problem, opportunity or project

Professional reviewers look for the application of chemical engineering principles and theory in identifying a problem and how you were able to arrive at its solution, or in identifying and defining an opportunity or project and how to tackle it.

Examples:

How are you proactive in anticipating problems in your work and how do you subsequently go about overcoming these problems or finding solutions? Please specify particular calculations, research, analysis modelling etc you may have used in your work (you do not have to include workings or appendices) highlighting areas of complexity.

You may consider:

- designing experiments to study heat transfer rates in a fluidised bed combustion chamber;
- selecting design codes for a vacuum vessel and pipework;
- specifying process and equipment modifications to update a pharmaceutical water system; or
- identifying thermal cycling problems and developing an improved control system.

You might write:

- "I used the Joukowsky Equation to calculate the magnitude of the surge pressure expected in a pipeline and…"

A2 – Combining ideas and contributions of different people and disciplines to arrive at appropriate engineering, technical or scientific solutions

The professional reviewers look for reference to chemical engineering principles as well as for you to explain the technical advice you sought from other disciplines, how you applied their advice in advancing your task and, where appropriate, re-engaged with them to achieve the outcome. If you describe an example where you were part of a team, you should explicitly describe how you contributed and what tasks you performed in conjunction with other's contributions to achieve the team outcome, bearing in mind the need to articulate your use of chemical engineering skills and knowledge.

Examples:

Convey your ability to obtain information from an interdisciplinary team with which you need to work collaboratively, including other engineers, scientists, specialists, public authorities, finance, sales and marketing, in order to come up with the appropriate engineering solution. How do you identify the right people to source information/advice from and use the skills and knowledge of others to arrive at an outcome that you would not have been able to achieve individually?

You may consider:

- obtaining data from a multidisciplinary team of chemists, biologists and controls engineers to solve a fermentation problem in protein packaging;
- providing a key contribution to a team of chemists, engineers and operators to commission an automatic chemical analysis system; or
- consulting reservoir engineers to obtain operating forecasts, and uncertainties, and use them as part of process design calculations.

You might write:

- "I was responsible for sourcing information from geologists and petrophysicists that allowed me to develop a cost effective and optimised well design by analysing…"

A3 – Displaying creativity and innovation: developing your own ideas to produce new engineering, technical or scientific solutions, new designs and new technological approaches

The professional reviewers look for you to highlight the creative elements of the approach you have taken to developing solutions in chemical engineering applications, or the novel aspects you have included in your work, as well as detailing the chemical engineering skills and knowledge employed to reach the outcome.

Examples:

Consider how you make improvements and modifications to your ideas, designs, technical solutions, looking at reducing cost or improving efficiency or any general improvements to a design or problem that is in front of you. You are not expected to be registering your own patents or inventing new formulae. Think about the benefit of the design that you come up with. Think about how you approach a new or novel approach within your role and what were the specific outputs. Draw upon comparative situations and linking to proven solutions. Look at how do you overcome these issues by being creative and innovative within your role. Consider how you identify technologies or approaches that have been applied in another industry or sector and how they can be adapted or modified and applied to your own situation.

You may consider:

- developing new commercial standard design software for gas absorption processes;
- developing new materials for artificial organs;
- commercialising a novel consumer washing powder at production scale; or
- recommending and installing advanced process control to improve plant performance.

You might write:

- "I found a new approach in the technical literature to a long-standing problem and investigated how to apply this…"

A4 – Undertaking scientific or technical evaluation and optimisation (of product, process, equipment, method, project etc) against the requirements you identified, or the brief you were given

The professional reviewers look for the remit or requirements of your task and how you conducted a technical evaluation or optimisation study/activity considering the various influencing factors, available variables to be adjusted, practical/contractual limitations and constraints and desired outcomes using chemical engineering skills and principles.

Examples:

Talk about how you use chemical engineering to ensure your solutions are safe and feasible before you implement them. If you have had access to data from a processing operation, explain in this section how the materials being processed behave in practice. Show how you undertook scientific or technical evaluation and optimisation against a given requirement utilising chemical engineering principles and using an evaluative approach; this could be in regard to a process, product or piece of equipment, considering it versus the brief requirement; cover how the solutions you come up with are safe and are feasible, and write about how you approach the particular evaluation, and also the chemical engineering skills that you drew upon during that evaluation stage. You should explain the practical, commercial or other constraints and limitations present and how you considered them.

You may consider:

- carrying out sludge dewatering trials to select the most appropriate processes;
- evaluating alternative control schemes for a pasteuriser using a simulation system;
- assessment of the effect of raw material quality changes on expected plant performance;
- identification of credible overpressure scenarios for a compressor and calculation of relief rates required for each to determine the controlling case for design;
- analysis and assessment of operating data to identify a problem/trend in performance of process plant; or
- modelling and analysis of distillation column operating conditions and controller set points to maximise recovery of high-value products.

You might write:

- "I measured flow and concentrations to produce a mass balance for identifying, then reducing, materials losses…"

A5 – Planning and executing projects: organising or performing technical work to implement or validate solutions, designs etc

The professional reviewers look for how you plan and execute your tasks, and/or those of other people, taking into consideration scheduling, resources, priorities, contingencies, budgets etc, within a chemical engineering application environment in order to achieve the outcome. Some explicit demonstration of chemical engineering principles/knowledge/skills is required within the examples provided. Submissions which solely contain examples of 'project management' skills are unlikely to be accepted.

Examples:

Talk about your contribution to the delivery of chemical engineering related projects and specify if you were the discipline or technical lead. Ideally, a few years into your career you should have experience of working on various stages of a project, eg from planning and research to development and implementation to manufacture or marketing and sales etc. Write about your experience at multiple stages of project planning and delivery and you might like to refer to some commercial aspects. Talk about your contribution to carrying out work to validate/confirm designs and planned activities, and how your work can or did affect the outcome in terms of planning and work management. You should illustrate how your tasks, and those of others that you were accountable for managing, fitted into the context of the project or overall task (including use of company management and project processes/procedures) and how you considered and factored in the constraints imposed – eg budget, schedule and resource. You might refer to specific project management skills that you applied to manage your own work or that of others.

You may consider:

- devising changeover procedures to convert to new control hardware and alignment with planned plant downtime for implementation;
- commissioning an acid plant conversion section and comparison with designs;
- validation of air handling and gas filtration system design as part of a programme to erect a new clean room manufacturing facility;
- managing the development of piping and instrumentation diagrams (P&IDs) for new projects within project timescales; or
- developing performance tests and acceptance criteria for a new plant and adding them to the project plan and schedule.

You might write:

- "I developed a proposal to change the location of the H2S scavenger injection point to improve performance and progressed this through the company management of change (MoC) process…"

Section B – Evidence that you are able to handle the wider implications of your work as an engineer

Demonstrate your awareness of the safety, environmental and commercial implications of your work. Developing awareness does not mean that you need expert experience working as a safety engineer, environmental consultant or project manager – these issues should be inherent in the work of any chemical engineer.

We recommend that for section B1, that you should typically provide three to five diverse examples demonstrating a range and breath of appropriate safety related activities. For sections B2 and B3 we suggest that you provide two to three examples. The level of technical detail in your examples for section B may be lower than that given in section A, and you should explain the implications of the situation with relation to safety, sustainability, commercial etc aspects and how your work took these into account.

B1 – Ability to handle health, hazard and safety aspects: to apply appropriate principles, good practice, meet legislative requirements etc

Safety is a critical issue. Professional reviewers look for knowledge and breadth of experience, where you identify, evaluate and address process safety issues in research, design or operation, contribute as a chemical engineer in structured process hazard evaluation, show a clear understanding of the legislative requirements and the wider impact that safety related issues can have.

In general, the examples you provide should be related to engineering process safety and should avoid examples of occupational safety unless there is a clear linkage to engineering and process risk.

Examples:

- show experience of systematically evaluating either a new design or an existing process to identify, evaluate and address process hazards;
- give direct examples that describe your contribution to ensuring safety and health in process operations (which may include laboratories) and could be development, pilot, or full scale, with an emphasis on engineering and process safety;

- demonstrate how you apply key principles and legislation and good practice regarding health and safety. If you work in different parts of the world and projects take you internationally, think about differences in compliance requirements, regulation and legislation and how you manage those differences;
- demonstration of selecting and applying appropriate standards to ensure a safe design.

You may consider:

- risk registers, safety inspections, compliance to regulation and legislation;
- attendance and contribution to any kind of process hazard analysis review meeting (eg HAZOP, HAZID, HACCP, "what if…" etc) or similar structured quantitative, semi-quantitative and/or qualitative risk assessments;
- management and control of hazards eg risk assessment, LOPA/SIL assessment;
- identification of overpressure scenarios and the subsequent design of pressure relief systems to required standards (eg API 520/521), design of emergency flares and fire-fighting systems;
- delivering training in the correct application of safety principles and procedures in any practical situation (on an operating site, in construction, in a laboratory etc);
- understanding of HSE legislation (eg H&S at Work Act, COMAH, COSSH or other local country legislation);
- experience with construction, commissioning and operating plant safety management systems – permit to work system, handling of hazardous materials, safety risk assessments etc;
- specific design activities – vent dispersion analysis, explosion modelling, hazardous/flammable emission detection systems etc;
- auditing safety compliance of a pilot plant used for teaching in a university;
- carrying out an investigation into a boiler explosion;
- undertaking or taking part in a Quantitative Risk Assessment (QRA); or
- carrying out failure mode and effect analysis (FMEA) studies.

You might write:

- "I represented the process design of my project section in a HAZOP review and explained the design basis for the reactor relief valve…"

B2 – Ability to handle sustainability aspects: these could include environmental, public concern and other societal issues, recognition of risks etc

Professional reviewers look for evidence that you recognise factors having environmental, public or societal impact in order to demonstrate an ability to handle sustainability aspects, and that you use chemical engineering principles to manage (identify, evaluate, control or mitigate) these issues within research, design or operation.

Examples:

Demonstrate the sustainability aspects of your role and how you manage environmental concerns, recognition of risk, and public or societal issues. Examples of this could be things like reducing waste – whether that's air, water or other types of pollution; emissions; impact assessments; sustainability analysis. Consider how you addressed issues that might affect members of the public who live and work in proximity to your plant/operation.

You may consider:

- investigating the bio-remediation of contaminated soil;
- preparing environmental impact assessment documents for a solvent plant;
- implementing and monitoring an ISO14000 environmental management system at an oil refinery;
- analysis and investigation of ways of reducing energy use;
- undertaking or taking part in an Environmental Impact Assessment (EIA);

- creating technical content for a MATTE (major accident to the environment) assessment;
- contact with the public regarding the resolution of an environmental issue;
- presenting a clear appreciation of the environmental impact and mitigation factors in the design implementation of any new project;
- undertaking design work to remove a sold/liquid/gaseous effluent problem;
- involvement in reduction or better utilisation of waste material or energy streams, contributing to better sustainability; or
- specific design activities such as environmental noise mapping, design to mitigate fugitive emissions (seal systems) etc.

You might write:

- "I ensured that plant emissions controls complied with best available technology by evaluating…"

B3 – Ability to handle commercial and economic aspects

Professional reviewers look for evidence of commercial and economic aspects through sales and business management tasks you may have undertaken or demonstration of commercial and economic considerations in conducting evaluations, managing tasks and projects and arriving at solutions or running/supporting operations.

Examples:

Demonstrate your experience in the economic evaluation of a process or a plant design that you are involved with, and procurement activities including cost estimation, tendering for bids, managing budgets or managing people resources. Demonstrate how plant operations are run in order to comply with relevant commercial agreements and legal obligations.

You may consider:

- devising a spreadsheet to optimise refinery product mix schedules based on market price data;
- estimating capital and operating costs for alternative designs;
- carrying out an insurance risk assessment for a novel manufacturing process;
- assessing the cost implication of loss of yield versus shut down costs for cleaning;
- gaining experience in a sales or marketing role (eg as part of a training rotation);
- gaining experience in a cost estimating and/or procurement role;
- undertaking a technical-commercial optimisation study to find an economically feasible solution;
- planning and managing a small project, or part of a larger project, in terms of schedule, staff/cost budget, equipment costs etc;
- tendering for the purchase of chemicals and equipment for a research laboratory; or
- developing start-up sequence for a plant with multiple third-party feedstocks to balance competing issues of efficient start-up operations and commercial agreements.

You might write:

- "I set out the cost and non-cost implications of introducing a further production line on site…"

Section C – Evidence of your interpersonal, leadership and communication skills

Convey how you effectively communicate and work with professionals at all levels. How do you ensure your colleagues know what you are doing and how do you gather information on issues concerning you?

We recommend for sections C1 and C2, that you should generally provide two or three examples. You might consider adding an additional bullet point example to show breadth. For section C3 we recommend providing three to four examples, which should include both oral and written communication.

C1 – Managing interpersonal communications and relationships including demonstrating an awareness of diversity and inclusion

Professional reviewers look for evidence of specific interpersonal techniques you apply in building, managing and sustaining your interpersonal relationships within teams, with juniors, peers, managers, clients, vendors etc and how, for example, you may have managed a difficult situation within a work-based scenario. Professional reviewers are also looking for information on why particular approaches and techniques were used and why they were the most appropriate for the situation. You are expected to provide evidence in this subsection that demonstrates an awareness of diversity and inclusion issues.

Examples:

Many roles involve the effective use of teamwork, and you should demonstrate your effectiveness in managing interpersonal relationships when working in a team environment. This may be in a project setting but can apply to working with others (including other disciplines and non-engineering professions) on an operating plant or in an academic environment.

Give specific examples where your contribution had an important effect or impact, rather than simply "working in a team". How does the development of professional relationships impact on your ability to do your job successfully?

Think about how you manage challenges within that particular team, how you resolve conflict, whether you need to be culturally aware within a particular project and how you adapt your communication style in order to achieve objectives across teams.

Consider how you have successfully established, built and maintained one to one working relationships, or dealt with conflict. You might consider how you have had to adapt your usual working style to take account of the other person or the context of the situation. Consider how diversity and inclusion issues affect how you conduct yourself and how they impact upon your work.

You may consider:

- addressing a conflict between yourself and another person, or between two other team members;
- working with external clients, contractors, suppliers, regulators or other organisations;
- engaging with a new team to establish professional working relationships;
- being mindful of home-schooling demands during lockdown and making allowance for young children interrupting virtual meetings or being mindful of religious holidays and avoiding scheduling meetings during these;
- being mindful of the diversity of the team and avoiding team building events in pubs/centred on alcoholic drink where this might make some members of the team feel uncomfortable;
- encouraging everyone to speak up in a meeting being careful to not allow a few to dominate; including comments written in the chat during virtual meetings as not everyone wishes to verbalise their comments;
- welcoming and acknowledging each opinion irrespective of where it comes from; encouraging others to be open and listen to ideas especially if different from their own; or
- challenging behaviours that might exclude others from engaging and participating; being prepared to provide feedback to others who might not have noticed the consequences of their actions/behaviour.

You might write:

- "Following production difficulties, I promoted a project aimed at continuous improvement within a staff group by..."

C2 – Demonstrating leadership in a professional role

Professional reviewers look for evidence of mature competence where, using your chemical engineering skills, you have demonstrated technical leadership in a professional capacity, including for example going beyond your remit by taking responsibility and following through on problems identified, or have been given accountability for achieving completion of work by others. Evidence of team management may be used as supplementary evidence. Professional Reviewers look for information on the specific leadership skills and techniques employed and why they were selected and appropriate for the situation you describe.

Examples:

You should demonstrate abilities in making decisions that require an expected level of maturity. Such decisions could be primarily in a technical context (eg resolving an operating problem or making a design decision about a piece of equipment) or by supervising a group of engineers. It could also be demonstrated in the training of junior engineers.

You do not necessarily have to be the manager of a team of engineers to demonstrate leadership. Applicants on a quality graduate training scheme (with IChemE accreditation for instance) may be able to demonstrate the required level of competence relatively early in their career, and many will not have had experience of managing their peers or leading teams.

Think of other ways you demonstrate leadership, for example working pro-actively as an individual eg initiating projects, delegating work, training your peers, providing direction to operators or technicians. Perhaps you have been involved with the training of other engineers or junior members of staff, perhaps you have led the promotion of chemical engineering say at a local school, university or community outreach program or event.

You may consider:

- ensuring that variations from quality standards, programme and budgets are identified and that corrective action is taken;
- agreeing objectives and work plans with teams and individuals;
- leading and supporting team and individual development; or
- leading a technical review.

You might write:

- "When I was working at a chemical plant, I conducted several process upset investigations…"

C3 – Communicating ideas and plans by report writing and oral presentation

Professional reviewers look for evidence of the ability to communicate with professionals and others at various levels by transfer of ideas, plans, facts and technical data through written reports and oral presentations. They are looking for information on how and why the communication type, style and content have been tailored considering both the audience and the purpose.

Examples:

The ability to present ideas, facts and experiences in a clear and concise manner is an important aspect of being a professionally qualified engineer. You should give evidence here of writing and editing reports and oral presentations (not necessarily technical) that you give to different audiences, such as technical sales pitches, stakeholder communications, regulators and funders, and how you adapt your presentation delivery for different audiences. Work completed for a PhD, EngD or similar/other academic research may be relevant.

You may consider:

- writing a user requirement specification (URS) for a control system;
- delivering a presentation to peers/supervisors;
- preparing/presenting a technical paper, report or seminar (eg at an event or conference);

- writing screen displays for an acid plant conversion to computer control;
- provision of technical guidelines to assist in product selection;
- presenting alternative design options to senior management; or
- supporting a sales presentation.

You might write:

- "I devised a slideshow of the implications to the plant of a new product variant, which I specifically tailored to recognise different senior managers' interests..."

Section D – Evidence to show that you are committed to high standards of professional and ethical conduct

Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.

We recommend for section D1 you provide three to five examples to show a range of examples and situations. For section D2 we recommend one or two examples.

D1 – Professional conduct

Professional reviewers look for evidence of your knowledge and use of professional standards, your commitment to quality in ensuring that yours and others' work is to a recognised standard and that you seek to support and promote the profession.

Examples:

- demonstrate your commitment to ensuring that your work is of the highest possible standard and that you seek continuous improvement and advancement in your work, both as an individual and by engaging and participating with the wider profession;
- You should include use of technical and engineering standards in the examples provided.

You may consider:

- adherence to your organisation or company quality management system and its approved procedures;
- professional activities over and above your core role;
- mentoring or encouraging others to maintain competence;
- identifying and providing feedback and lessons learned to improve technical standards;
- awareness and compliance with relevant code of conduct to your work activities over and above your core role;
- support to wider profession in member group activities, science and technology initiatives, school outreach etc; or
- promoting diversity and inclusion in the workplace to support the wider profession.

You might write:

- "Whilst working on a design activity I identified a conflict between my company technical standards and those of the client..."
- "I am active within my local member group and have organised various technical seminars on the subject of (...) to help others gain an understanding of this field."
- "I have volunteered in my community to promote engineering to school children with the aim of securing the next generation of chemical engineers."
- "I have trained younger engineers in... as part of an ongoing scheme to ensure competence across my company."

D2 – Ethical decision making

Professional reviewers look for evidence of your integrity as an engineer in the decisions you make relating to the tasks you undertake and the application of ethical decision making within a work-related or professional scenario. Explanation of the most relevant ethical issues in your role (and what conflicts might arise) and how you have applied any ethics-based learning you undertake to real examples may be used as supplementary evidence.

Examples:

Give direct examples which illustrate your personal and ethical commitment of working to ethical and professional standards laid out by IChemE, your company or organisation, and of the wider community.

You may consider:

- IChemE's Code of Professional Conduct and the Engineering Council Statement of Ethical Principles; how this impacts on your behaviour and influences your decision making;
- issues of commercial confidentiality;
- issues of personnel confidentiality;
- avoiding conflict of interest; or
- knowledge and application of company codes of conduct/standards/behaviours/values.

You might write:

- "I faced a professional dilemma when my company secured a contract with my previous employer, so I…"
- "While overseeing the installation of a new catalyst into a reactor, I resisted pressure from more senior operating staff to dispense with certain safety checks despite their concerns about this leading to a delay to start-up by..."

Section E – Continuing Professional Development (CPD)

In this section you should outline your recent development and short to medium-term development plans. You should also describe the received and potential benefits associated with these goals. You will also need to describe how you identify and plan your CPD, and how you record activities carried out.

We recommend you provide sufficient number of examples to reflect a range of CPD undertaken and planned.

E1 – Report of recent CPD already undertaken (eg within last two years)

Professional reviewers look for information on how you record your CPD and evidence of CPD undertaken which demonstrates systematic identification of development needs, acquisition of knowledge and skills, and the development of personal qualities, to maintain and enhance professional competence, both technical and non-technical skills (eg business, interpersonal etc).

Examples of CPD activity types:

- in-house/external training courses (online or face-to-face);
- attending/delivering activities run by IChemE member groups or special interest groups;
- on-the-job learning;
- experience of working in different disciplines within chemical engineering; or
- research/publishing: make a note of what it was, why you did the research and what was the outcome – how you used the research within your role.

It is likely that you are already logging your CPD either in mycareerpath or your company's own career development tool, so extracting the required information should be straightforward.

Examples:

The questions contained in the C&C are shown below, along with an explanation of the type of evidence needed for each.

C&C questions	Types of evidence
Briefly describe the methods and tools you use to record your CPD activities.	Explain how you maintain your record of CPD activities undertaken. Your recording should include details of activity, type and when and where carried out. Both planned and unplanned CPD should be recorded. Examples of actual CPD activity should not be listed here. See IChemE's website for more information: www.icheme.org/cpd
Describe the significant CPD activities you have carried out in the last one–two working years. For each activity listed, describe the purpose/objective of carrying it out and the benefits you gained from it.	Provide details of the significant CPD activities you have undertaken in the recent past, which should include brief description of the activity and content, duration and delivery method. These would normally include activities from the broad range of CPD activity types (training courses, work based (on the job), academic learning, volunteering, events/seminars and self-study etc).For each activity, please give a brief description of the purpose/objective that lay behind the activity being performed, and what key benefits you gained by carrying it out.

E2 – Future CPD plan

Professional reviewers look for your ongoing approach and commitment to CPD. This will include providing details on needs identification, creation of specific CPD development objectives and turning the development objectives into a viable and resourced CPD plan for the upcoming period.

Examples:

C&C questions	Types of evidence
Briefly describe the method and approach/tools that you use to identify your CPD development objectives, and how they are turned into an actionable plan.	Give a brief outline of the process/steps you follow to create your CPD objectives and create a viable plan. You should include as appropriate (a) how your CPD needs are identified and prioritised, (b) how and with whom they are agreed (if required), and (c) how those objectives are then turned into a plan which can be put into action. This process will vary depending on your own personal circumstances and may refer to your employer's annual development review process and tools. Where appropriate, links to longer-term career plans should be included.
Describe the development objectives that you have identified to be addressed in the next one–two years and the purpose of each one. For each objective listed, describe what activities you plan to carry out to achieve them and the expected timescale.	Give a brief description of the key development objectives that you have identified for the upcoming period and explain why those particular objectives were chosen. For each objective, please provide brief details of the activities you will undertake to complete each one and give an indicative timescale for each objective.

Appendix F

Completing your C&C: Professional Process Safety Engineer – section by section guidance

Amongst the examples of evidence that you provide, you should demonstrate the four key concepts of process safety listed below. You may provide these examples in any of the sections below, depending on your experience:

- hazard identification;
- consequence and risk;
- application of safeguards including inherent safety, preventative and mitigative safeguards and demonstration of ALARP;
- lessons learned.

Section A – Evidence of applying your knowledge and understanding to practical situations

Professional Process Safety Engineers shall use a combination of general and specialist engineering knowledge and understanding to optimise the application of advanced and complex systems.

You must demonstrate the ability to understand underpinning process safety principles relevant to your area of practice and to apply them to develop technical solutions. This demonstration could involve technical solutions for novel problems or dealing with significant technical complexity and may involve the integration of a range of technologies and consideration of other factors. This requires that you are maintaining and developing your knowledge in your field of practice and not just that required for specific tasks.

A1 – Demonstrate you have maintained and extended a sound theoretical approach to enable you to develop as a Professional Process Safety Engineer

An understanding of engineering principles and their application is important for a Professional Process Safety Engineer, who is required to challenge designs by constantly asking "what if?". Process plants are inherently a compromise, and an applicant is required to demonstrate the ability to successfully weigh up different factors to derive successful technical solutions.

Examples of evidence:

- knowledge of process safety principles and appropriate process safety standards;
  - compliance with the principles of the inherently safer design, where one tries to avoid or eliminate hazards, or reduce their magnitude, severity or likelihood of occurrence, by careful attention to the fundamental design and layout. Less reliance is therefore placed on protective systems and controls, which can and do fail;
  - compliance with the principles of the inherently safer design, where one tries to avoid or eliminate hazards, or reduce their magnitude, severity or likelihood of occurrence, by careful attention to the fundamental design and layout. Less reliance is therefore placed on protective systems and controls, which can and do fail;
  - show experience of identifying hazards, their causes and effects, such as toxicity, fire or explosion, utilising a range of formal techniques;
  - knowledge of the principal mechanisms involved in consequence assessment eg source term, dispersion, fires, explosion, toxicity and environmental consequences;

- demonstration of sufficient core engineering competency to be able to understand a process, what the potential hazards are and how they could be realised. These competencies could include familiarity with physical and hazardous properties of materials or knowledge and use of process equipment design criteria and protection;
- show an understanding of the differences between individual and societal risks and how they are determined;

- understanding of the current and emerging technology and techniques associated with good practice in process safety;
  - take an active role in studies such as HAZID, HAZOP, CHAZOP, What If, FMEA, LOPA, SIL, etc, with input from other disciplines. For each technique understand the benefits, disadvantages and have experience of application during design and/or operation;
  - show an understanding of how inherently safe technical solutions are developed to control hazards (reducing inventories and selecting appropriate control parameters). Understand, identify and evaluate inherently safer design options to reduce the inherent hazards and risks at source rather than adding more risk treatments/safeguards;
- developing a broader and deeper knowledge base through research and experimentation;
  - show experience of systematically evaluating either a new design or an existing process to identify, evaluate and address process hazards;
- learning and developing safety management principles and techniques in the workplace.

A2 – Demonstrate the use of techniques and technological solutions to identify and assess complex process safety problems

The ability to utilise appropriate methodologies to identify where the level of risk is above recognised levels of tolerability and as to how suitable risk treatment options were then developed with the relevant technical resources and stakeholders. In particular, the choice of methodologies and risk treatments for non-standard tasks. The ability to evaluate process development data for its adequacy for the risk assessment and the knowledge basis on where such additional data as required should be obtained. The ability to work on complex tasks with multi-disciplinary teams. The ability to review and if appropriate optimise existing processes.

Examples of evidence:

- carrying out technical research and development relevant to identifying, assessing and mitigating process safety risks;
- supporting or developing new designs, processes or systems based on new or evolving technology;
- carrying out complex and/or non-standard technical analyses;
  - demonstrate an understanding of the different consequences and the ability to utilise appropriate methodologies to determine the magnitude of those consequences relevant to the industry that the candidate works in. eg explosions, fires, toxic releases, radiation etc;
  - use of the effects of toxic exposure, heat radiation, blast overpressure and the use of probit analysis;
  - experience in interpreting results of consequence models, being aware of the key modelling techniques and limitations and in interpreting the results in terms of site risks;
  - identify pertinent weather information and analysis of data for the selection of meteorological scenarios for the analysis;
- developing solutions involving complex or multidisciplinary technology;
- developing and evaluating continuous improvement systems.

A3 – Displaying creativity and innovation: developing your own ideas to produce new engineering, technical or scientific solutions, new designs and new technological approaches

The professional reviewers look for you to highlight the creative elements of the approach you have taken to developing solutions in chemical engineering applications, or the novel aspects you have included in your work, as well as detailing the chemical engineering skills and knowledge employed to reach the outcome.

Section B – Demonstrate you take an active role in the identification and definition of process safety and sustainability requirements, problems and opportunities

Professional Process Safety Engineers shall apply appropriate theoretical and practical methods to the analysis and solution of process safety problems.

You must demonstrate the ability to apply engineering knowledge effectively and efficiently to the individual tasks which need to be undertaken in your role.

B1 – Demonstrate you take an active role in the identification and definition of process safety and sustainability requirements, problems and opportunities

Knowledge and breadth of experience, where you identify, evaluate and address process safety and sustainability issues in research, design or operation, contribute as a Professional Process Safety Engineer in structured process hazard evaluation, show a clear understanding of the legislative requirements and the wider impact that safety related issues can have.

Examples of evidence:

- identifying projects or technical improvements to products, processes or systems;
  - show experience of systematically evaluating either a new design or an existing process to identify, evaluate and address process hazards. Give direct examples that describe your contribution to ensuring safety and health and sustainability in process operations (which may include laboratories) and could be development, pilot, or full scale. Demonstrate how you apply key principles ad legislation and good practice regarding health and safety and sustainability to ensure reduction of risks so that they are tolerable. If you work in different parts of the world and projects take you internationally, think about how compliance, regulation and legislation changes and how you have to change with that as well;
- preparing specifications, taking account of functional and other requirements;
  - show experience of working over the lifespan of complex processes and the selection of different risk assessment techniques based on the phase of the development and the characteristics of the process/ equipment;
  - establish project safety and sustainability risk criteria based on the appropriate regulatory framework;
  - identify the sources and understanding the limits of component failure data and scenario frequency data;
- demonstrate the ability to develop technical solutions reducing risk by working with multiple parties, such as independent manufacturers, and the recognition of how process safety risks can be influenced by operating parameters, such as operation above the boiling point of a flammable liquid versus vacuum conditions;
- establishing user requirements;
- reviewing specifications and tenders to identify technical issues and potential improvements;
  - be able to identify where the level of risk is above recognised levels of tolerability and as to how suitable risk technological solutions are then developed with the relevant technical resources and stakeholders. In particular, the choice of methodologies and risk treatments for non-standard tasks;
  - be able to evaluate process development data for its adequacy for the risk assessment and the knowledge basis on where such additional data as required should be obtained. The ability to work on complex tasks with multi-disciplinary teams. The ability to review and if appropriate optimise existing processes;
  - carry out and be able to critically analyse and challenge results of process safety and major hazard risk assessments;
- carrying out technical risk analysis and identifying mitigation measures;
  - demonstrate a firm understanding of the range of risk modelling techniques available (qualitative, semi-quantitative and quantitative). Understand appropriate application and limitations for use in design and/or operations. Examples of RA techniques may include LOPA, FMEA/FMECA, FTA, bowties and QRA;
  - undertake complex process safety risk assessments;
  - develop recommendations for minimizing risk in accordance with the project risk criteria;
- considering and implementing new and emerging technologies.

B2 – Demonstrate you can identify the appropriate investigations and research needed to undertake the analysis required to complete a process safety task and conduct these activities effectively

Sufficient knowledge of the information sources available and to critically examine those sources to identify good practice in process safety. Use of investigations to gain information to support safety studies.

Examples of evidence:

- identifying and agreeing appropriate research methodologies;
  - use Process Safety Management Frameworks to demonstrate an understanding of the wide-ranging aspects of process safety. Implementation of published good practices for process safety management eg IChemE Safety Centre Framework, the Energy Institute Framework for Process Safety Management or the CCPS Guidelines for Risk Based Process Safety;
  - identify suitable mitigation measures to use for the hazards identified. Eg SIL, relief systems, firewater design, fire and gas, temporary refuge requirements, emergency response planning – and demonstrate that the mitigated risks are As Low As Reasonable Practical (ALARP);
  - assess applicability of existing standards and guidance to new technologies and have experience in understanding the limitations and uncertainties associated with process safety decision making;
  - show your understanding of the practical application of a variety of risk reduction techniques and their limitations for the identification, design and maintenance of preventative and mitigative barriers to reduce risk;
- investigating a technical issue, identifying potential solutions and determining the factors needed to compare them;
- identifying and carrying out physical tests or trials and analysing and evaluating the results;
- carrying out technical simulations or analysis and interpreting the results;
  - determine what process safety analysis is required to aid decision-making for design or operations to ensure risks are reduced to ALARP;
  - develop the scope the scope of work for process safety analysis to determine levels of hazard and risk;
  - apply a process safety framework to a design or operational scenario;
- preparing, presenting and agreeing design recommendations, with appropriate analysis of risk, and taking account of cost, quality, safety, reliability, accessibility, appearance, fitness for purpose, security (including cyber security), intellectual property constraints and opportunities, and environmental impact.

B3 – Demonstrate you can implement process safety tasks and evaluate the effectiveness (in terms of risk reduction) and limitations of process safety modelling and engineering or operational changes

Depth of understanding of process safety techniques including awareness of their scope and limitations of these techniques. The applicant is not simply applying techniques because a 'standard' says they have to be used. An understanding of the principles and practice of risk reduction. That the applicant has followed-up to ensure risk reduction solutions.

Examples of evidence:

- ensuring that the application of the design results in the appropriate practical outcome;
  - demonstrate how you apply key principles, legislation and good practice to ensure reduction of risks to ensure that plant design designs and operational risks are tolerable and As Low As Reasonably Practicable (ALARP);
  - understand and be able to compare relative risk reduction and merit of applying different risk treatment options (physical/engineering controls versus procedures/human intervention, passive versus active safeguards, alarms versus automatic shutdown, etc);
- implementing design solutions, taking account of critical constraints, including due concern for safety, sustainability and disposal or decommissioning;
  - understand, select and apply the appropriate hazard identification and risk assessment techniques to take part in safety-in-design and management of change activities;
- identifying and implementing lessons learned;

- evaluating existing designs or processes and identifying faults or potential improvements including risk, safety and life cycle considerations;
  - identify and evaluate design and operational changes to reducing process safety risks to the general public, neighbouring facilities and the environment;
  - understand how barriers are specified, testing regimes and likely failure modes;
  - understand the key safe systems of work needed for safe operation of a facility;
  - understand the need for consideration of external and severe weather impacts at the early design phase of a new facility and respond to changes in the surrounding environment;
  - identify likely scenarios to inform emergency response planning;
- actively learning from feedback on results to improve future design solutions and build best practice;
  - give direct examples that describe your contribution to ensuring safety and health and sustainability in process operations (which may include laboratories) and could be development, pilot, or full scale.

B4 – Demonstrate you bring about continuous process safety improvement and promote good practice

How you have ensured that potential design and/or operational safety improvements are investigated and implemented and ensured that the improvements represent good practice. That you take measures to ensure that you are aware of changes to regulatory requirements and good practice in the industry.

Examples of evidence:

- showing your understanding of the practical application of a variety of risk reduction techniques and their limitations for the identification, design and maintenance of preventative and mitigative barriers to reduce risk;
- demonstrate how you apply key principles, legislation and good practice to ensure reduction of risks to ensure that plant design designs and operational risks are tolerable and As Low As Reasonably Practicable (ALARP);
- demonstrate your understanding and practical application of Management of Change procedures;
- understand and be able to compare relative risk reduction and merit of applying different risk treatment options (physical/engineering controls versus procedures/human intervention, passive versus active safeguards, alarms versus automatic shutdown, etc);
- understand how barriers are specified, testing regimes and likely failure modes;
- understand the key safe systems of work needed for safe operation of a facility;
- identify and evaluate design and operational changes to reducing process safety risks to the general public, neighbouring facilities and the environment;
- understand the need for consideration of external and severe weather impacts at the early design phase of a new facility and respond to changes in the surrounding environment;
- identifying likely scenarios to inform emergency response planning;
- understanding, selecting and applying the appropriate hazard identification and risk assessment techniques to take part in safety-in-design and management of change activities;
- give direct examples that describe your contribution to ensuring safety and health and sustainability in process operations (which may include laboratories) and could be development, pilot, or full scale.

Section C – Responsibility, management and leadership

Professional Process Safety Engineers shall demonstrate technical and commercial leadership in the field of process safety.

An understanding and personal experience of process safety in the management/leadership role(s) you have undertaken across your career. This may involve works where process safety is monitored (eg KPIs identified), actions taken to improve process safety performance and the use of different types of auditing throughout the lifecycle of the plant or business to improve the safety performance and or culture.

C1 – Demonstrate you plan the work and resources needed to enable effective implementation of a significant process safety task or project

How you have identified and organised process safety works. This could include identification of key process safety objectives and resources required to undertake these works, through to the implementation and review of the completed process safety works.

Examples of evidence:

- preparing budgets and associated work programmes for projects or tasks;
- carrying out a task or project risk assessment and identifying mitigation measures;
- leading on preparing and agreeing implementation plans and method statements;
  - demonstrate how you are managing the organisation of the process safety works you are responsible for. For example, you may be part of a group or the leader of process safety works, which could include: update of a safety case/safety report, preparation of a Safety Assurance report, preparation of the basis of safety for a new project or preparation of a Property Insurance report for a site with Major Accident Hazard potential;
- negotiating and agreeing arrangements with customers, colleagues, contractors and other stakeholders, including regulatory bodies;
- ensuring that information flow is appropriate and effective;
  - understand safety critical element maintenance/testing requirements as application of resources to process safety management framework activities.

C2 – Demonstrate you manage (organise, direct and control), programme or schedule, budget and resource elements of a significant process safety task or project

How are you managing the resources (including costs and budgets) which you have available for significant process safety works.

If you are a team leader, how are you currently managing competing objectives or challenges from a number of process safety related projects in parallel. You need to be detailing the methods and or techniques you are using to prioritise your works.

Alternatively, you may be the sole employee or not have any line management responsibilities at your organisation, how are you managing meeting your deadlines, which may involve the management of sub-contractors and the approval of their works.

Examples of evidence:

- operating or defining appropriate management systems including risk registers and contingency systems;
  - lead on preparing and agreeing safety justification plans and procedures;
  - be able to determine, monitor and improve process safety KPIs within the workplace or to influence process safety culture, should be presented;
- managing the balance between quality, cost and time;
- monitoring progress and associated costs and cost forecasts, taking appropriate actions when required;
  - prepare budgets and associated work programmes for the projects or tasks;
- establishing and maintaining appropriate quality standards within legal and statutory requirements;
  - have experience in leading or participating in the auditing of process safety, to possibly include:
    - implementation of Safe and Unsafe auditing;
    - Major Accident Hazard auditing and training;
    - evaluating industry good practice and showing what improvements would be needed within a plant or organisation to meet good practice;
- interfacing effectively with customers, contractors and other stakeholders;
  - ensure that information flow is appropriate and effective.

C3 – Demonstrate you lead teams or a technical specialism and assist others to meet changing technical and managerial needs

How you as a process safety leader or specialist are developing others and or adapting to changes.

As a Leader, how are you able to demonstrate that process safety within your area of responsibility is fit for purpose. This could include identification of training needs for individuals or at a team or group level, relating to process safety, where you are the responsible person. Where you may not be in a position with direct line management responsibilities, you need to be demonstrating how you are influencing your business in process safety management. If you work in different parts of the world and projects take you internationally, think about how compliance, regulation and legislation changes and how you have to change with that as well.

Examples of evidence:

- agreeing objectives and work plans with teams and individuals;
- reinforcing team commitment to professional standards;
- leading and supporting team and individual development;
- assessing team and individual performance, and providing feedback;
- seeking input from other teams or specialists where needed and managing the relationship;
    - develop process safety solutions involving complex or multi-disciplinary technology;
    - interface effectively with customers, contractors and other stakeholders;
    - negotiate and agree arrangements with customers, colleagues, contractors and other stakeholders;
- providing specialist knowledge, guidance and input in your specialism to engineering teams, engineers, customers, management and relevant stakeholders;
- developing and delivering a teaching module at master's level, or leading a University research programme in process safety, developing and evaluating continuous improvement systems.

C4 – Demonstrate you bring about continuous quality improvement and promote good process safety practice

What techniques are you using within your organisation to ensure there is continuous quality improvement relating to process safety and how are you promoting process safety where you work or have worked?

Examples of evidence:

- promoting process safety throughout the organisation as well as its customer and supplier networks;
    - relate to the promotion of process safety within your workplace, what techniques are you employing or have used to ensure lessons from historical incidents are shared and your organisation has an effective corporate memory relating to process safety;
- developing and maintaining operations/organisations/teams to meet quality standards eg ISO 9000, ISO 45001, EQFM, IChemE Safety Centre Framework, Energy Institute Framework for Process Safety Management or CCPS Guidelines for Risk Based Process Safety;
    - involve in defining or delivery of process safety training for the wider organisation;
    - develop of standards or procedures related to process safety within your organisation;
- supporting or directing project evaluation and proposing recommendations for improvement;
- Identifying and sharing the results of lessons learned;
    - undertake an incident investigation to determine root causes and recommending actions to prevent recurrence.

Section D – Communication and interpersonal skills

Professional Process Safety Engineers shall demonstrate effective communication and interpersonal skills.

This is the ability to work with others constructively, to explain hazards, risks and legal obligations clearly and to discuss issues objectively and constructively.

D1 – Demonstrate you communicate effectively with others, at all levels, in English

The ability to communicate with professionals and others at various levels by transfer of ideas, plans, facts and technical data through written reports and oral presentations. The ability to present ideas, facts and experiences in a clear and concise manner is an important aspect of being a professionally qualified engineer. You should give evidence here of presenting orally (including developing presentations) and writing and editing reports, that you give to different audiences. You should explain how you adapt your communication type, style, and content for different audiences. Ideally, the examples you give will relate to the communication of process safety related materials.

Examples of evidence:

- preparing reports, drawings, specifications and other documentation which clearly convey to both technical and lay personnel the hazards, risks and legal obligations associated with process safety matters;
  - contribute to technical/scientific papers or articles as an author;
  - prepare and delivering presentations on process safety matters;
- leading, chairing, contributing to and recording meetings and discussions;
  - facilitate, contribute and record process safety forums such as HAZID and HAZOP studies;
- exchanging information and providing advice to technical and non-technical colleagues;
  - compile relevant historical incidents on plant and other similar global industrial incidents/losses and presentation of them to team to communicate historic event frequencies;
- engaging or interacting with professional networks.

D2 – Demonstrate you clearly present and discuss proposals, justifications and conclusions

Communicate and engage with others when agreement is required, for example on which option to select from a range of possibilities, or where you are required to engage with others to develop items such as a proposal, bid, or scope of work or to agree on the results or conclusions of work performed.

You should give evidence which explains how you communicate options and obtain agreement from others to select an option from those presented and/or how you work with others to develop and agree a position on a topic, document or way forward with a piece of work. You should explain how you communicated and engaged with the other parties involved to achieve consensus and why you adopted the approach you took.

Examples of evidence:

- contributing to scientific papers or articles as an author;
- preparing and delivering presentations on strategic matters;
  - present to a regulator;
  - present to management to gain funding for process safety activities or modifications to plant identifying, agreeing, and leading work towards collective goals;
- preparing bids, proposals or studies;
- identifying, agreeing and leading work towards collective goals;
  - gain consensus on how to proceed for mitigations of hazards.

D3 – Demonstrate your personal and social skills and awareness of diversity and inclusion issues

Personal and social techniques you apply in building, managing and sustaining your interpersonal relationships and being supportive of the needs and concerns of others, especially where this relates to diversity and inclusion. The context will be within teams, with juniors, peers, managers, clients, vendors etc and how, for example, you may have managed a difficult situation within a work-based scenario.

You should give specific examples where your contribution had an important effect or impact, rather than simply examples of 'working in a team'. Consider how the development of professional relationships impacts on your ability to do your job successfully. Evidence of liaising with external clients, suppliers and organisations can also be considered.

Think about how you address the needs and concerns of others and manage challenges within a team or in a professional relationship, how you resolve conflict, whether you need to be culturally aware within a particular situation and how you adapt your style in order to achieve objectives. Consider how you take diversity and inclusion issues into account within your professional relationships.

Examples of evidence:

- knowing and managing own emotions, strengths and weaknesses;
- being confident and flexible in dealing with new and changing interpersonal situations;
- identifying, agreeing and working towards collective goals;
- creating, maintaining and enhancing productive working relationships, and resolving conflicts;
    - many roles involve the effective use of teamwork, and you should demonstrate your effectiveness in managing interpersonal relationships when working in a team environment. This may be in a project setting but can apply to working with others (including other disciplines and non-engineering professions) on an operating plant or in an academic environment;
- being supportive of the needs and concerns of others, especially where this relates to diversity and inclusion;
    - be mindful of religious holidays and avoiding scheduling meetings during these;
    - consider the diversity of the team and avoiding team building events in pubs/centred on alcoholic drink where this might make some members of the team feel uncomfortable;
    - encourage everyone to speak up in a meeting being careful to not allow a few to dominate; including comments written in the chat during virtual meetings as not everyone wishes to verbalise their comments;
    - welcome and acknowledge each opinion irrespective of where it comes from; encourage others to be open and listen to ideas especially if different from their own;
    - challenge behaviours that might exclude others from engaging and participating; be prepared to provide feedback to others who might not have noticed the consequences of their actions/behaviour.

Section E – Personal and professional commitment

Professional Process Safety Engineers shall demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.

You must demonstrate that you are acting in a professional manner in your work and in your dealings with others. As a Professional Process Safety Engineer, you should set a standard and example to others with regard to professionalism.

E1 – Demonstrate you understand and comply with relevant codes of conduct

Knowledge and application of relevant codes of conduct as you carry out your work as a professional engineer. The definition of codes of conduct can also include relevant legislation and regulatory frameworks.

Give examples of the codes of conduct, legislation and regulatory frameworks that are/were applicable to your work and how you maintained your knowledge of them and how they guided and influenced the work you carried out or the way in which you performed it.

Examples of evidence:

- demonstrating compliance with IChemE's Code of Professional Conduct;
- having identified aspects of the Code which are particularly relevant to your role;
- being aware of the legislative and regulatory frameworks relevant to your role and how they conform to them;
- leading work within relevant legislation and regulatory frameworks, including social and employment legislation;
- maintaining current knowledge of pertinent regulatory requirements and technical standards.

E2 – Demonstrate you understand the principles of sustainable development and apply them in your work

Environmental and sustainable development principles are considered and influence the work you perform to make a positive impact on these issues. Give examples of environmental and sustainability issues that have been considered as part of work you have performed and how your work sought to make a positive impact. You may also consider how these issues are considered in conjunction with other factors such as safety and commercial/financial.

Examples of evidence:

- operating and acting responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously;
    - take an active role in the assessment of the environmental impact of potential accidents and/or opportunities for improvement;
- providing products and services which maintain and enhance the quality of the environment and community, and meet financial objectives;
- recognising how sustainability principles, as described in the Guidance on Sustainability on page 48, can be applied in your day-to-day work;
- understanding and securing stakeholder involvement in sustainable development;
- using resources efficiently and effectively in all activities.

E3 – The applicant shall demonstrate that they understand the ethical issues that may arise in their role and carry out their responsibilities in an ethical manner

Integrity as an engineer in the decisions you make relating to the tasks you undertake and the application of ethical decision making within a work-related or professional scenario.

Give examples of ethical issues have arisen (or that might arise) in the course of your work, explaining the ethical issue, how you assessed the issue and decided what action to take. It is preferred if you can provide direct examples of actual issues you have encountered and addressed. Ethics based learning you undertake may be used as supplementary evidence.

Examples of evidence:

- awareness/identification of the likely ethical issues that you may encounter in your role and what guidance is appropriate to deal with them should they be encountered;
- giving an example of where you have applied ethical principles as described in the statement;
- giving an example of where you have applied or upheld ethical principles as defined by your organisation or company.

E4 – Demonstrate you carry out and record Continuing Professional Development (CPD) necessary to maintain and enhance competence in process safety

Plan, execute, and record your CPD together with evidence of CPD recently undertaken and planned for the future which demonstrates systematic identification of development needs, acquisition of knowledge and skills, the development of personal qualities, and supporting others to maintain and enhance professional competence.

This section has been split into four specific questions, to make it easier to provide all the required information.

E4.1 – Undertaking reviews of needs and planning

The information provided in this section must cover both of the following two items:

a. A brief outline of the process/steps you follow to create your CPD objectives and create a viable plan. You should include as appropriate (i) how your own development needs are identified and prioritised, (ii) how and with whom they are agreed (if required), and (iii) how those objectives are then turned into a plan which can be put into action. This process will vary depending on your own personal circumstances and may refer to your employer's annual development review process and tools (eg competence frameworks). Where appropriate, links to longer-term career plans can be included.

b. Provide some examples of CPD objectives that you plan to address in the next one to two years. This should include a brief description of each of the CPD objectives together with an explanation as to why it was chosen. For each CPD objective, please provide brief details of the activities you plan to undertake to complete each one and give an indicative timescale for each objective. Where appropriate 'measures of success' can also be provided.

E4.2 – Carrying out CPD and maintaining evidence/records of activity carried out

The information provided in this section must cover both of the following two items:

a. Give an explanation of how you maintain your record of CPD activities undertaken. Your recording should include details of activity, type and when and where carried out. Examples of actual CPD activity should not be listed here. See IChemE's website for more information: www.icheme.org/cpd

b. Provide some examples of recent (last one to two years) significant CPD activities you have undertaken. These would normally include activities from the broad range of CPD activity types (training courses, work based (on the job), academic learning, volunteering, events/seminars and self-study etc). For each item given, you should give a brief description of the purpose/objective that lay behind the activity being performed, and what key benefits you gained by carrying it out (eg what competencies were gained/enhanced). Both planned and unplanned CPD activities can be included.

E4.3 – Evaluating CPD outcomes and reflecting on CPD undertaking

The information provided in this section must cover both of the following two items:

a. For the items of CPD activity completed listed in E3.2, briefly explain how you have evaluated the outcome of those activities, ie did you succeed in meeting the carrying out the activities as per your plan, meeting your CPD objective against any 'measures of success' that you defined.

b. For the items of CPD activity completed listed in **E3.2**, briefly explain how you have carried out reflective practice on those activities, and what you have learnt from that reflection.

E4.4 – Assisting others

Examples of evidence:

- coaching or mentoring others in technical or non-technical skills;
- delivering a presentation to others on a technical topic to share knowledge, eg following a piece of study work or incident investigation;
- written a technical note summarising talks attended at a conference and sharing this with team members;
- delivering a safety moment as part of team meetings.

Appendix G

Technical Report Questionnaire example answers

Part O – Underpinning chemical and bio science		
0.1	Evidence of knowledge and understanding of relevant aspects of chemistry and bioscience, to enable the understanding of chemical engineering principles.	**Example 1 (Industry):** Achieved grade A at A level in both Chemistry and Biology. During first year at university completed a module in Chemistry covering both organic and physical chemistry (XX%). Laboratory work included organic synthesis, and analysis techniques including titration, gas spectrometry, mass spectrometry, and chromatography. **Example 2 (Academia):** I completed my first degree in Mechanical Engineering from the University of xxxxx. Prior to this I obtained A-levels in Mathematics, Physics and Chemistry, achieving grades of A,B,B. This gave me a good basic understanding of all areas of chemistry: organic; inorganic and physical chemistry. I also completed a module in Materials Science (GENG1033) in my first year of study, which gave me further understanding of chemistry applied to a range of materials including polymers. The course book for this module was *Materials Science* by Richard D. Alexander (4th Ed.). In my career with ABC Chemicals I have carried out a development project which looked at alternative formulations for the manufacture of chemical RST. This required obtaining a further understanding of chemistry and thermodynamics of the process to identify a different formulation and route for the production. I did this through study of standard textbooks (eg Denbigh, *The Principles of Chemical Equilibrium*) and guidance from colleagues. I carried out calculations for the new formulation and I was also required to determine rate equations and heats of reaction, required for the process design.

Part A – Fundamentals of chemical engineering		
1.1.1	Evidence of ability to apply the principles of material and energy balances.	**Example 1 (Industry):** To estimate the heat and material balance (H&MB) and performance for a licensed amine process, I developed a spreadsheet heat and material balance model. The licensor was unable to provide a H&MB in the required timeframe for the project which is why this work was needed. To achieve this, I determined the fundamental physical and thermal properties of the solvent based on the available information. I used this together with the selectivity of the solvent for CO2 and H2S that I had back-calculated to estimate the amine flowrate required under new conditions. To establish reboiler loads I used a combination of regressed data and semi-theoretical methods. The process flowscheme included pumps, heat exchangers, flashes, and absorber and stripper columns. Flashes were calculated within the spreadsheet by considering partial pressures and vapour pressures of the components. The model, including the estimated utility requirements for reboiler, condenser and plump loads was subsequently verified by the licensor confirming my approach and methodology. Through this task I learnt that it is relatively straightforward to approximate H&MB performance through use of chemical engineering fundamentals, even if specific details of the process are not known. I have since used this approach to rapidly derive process performance and provide simplified H&MBs to estimate equipment sizes without needing to resort to setting up complex simulation models.

		Example 2 (Academia): In my degree of mechanical engineering, I have studied modules in Engineering Thermodynamics (GENG1053) and Heat Transfer (GENG2012), both at basic and advanced levels. In my work I have gained experience in this area through two projects. In the first case a new route for the production of chemical RST was sought. This was a batch process, and it was necessary to find heats of reaction and rate equations in order to facilitate the design. I determined these through experiment and calculation and then was able to carry out a heat balance that tracked the reaction through time and, hence, determine the optimal cooling system required for the process. Later it was decided that a study should be carried out to convert from a batch to a continuous process. I was part of a small team of three that determined a possible flowsheet. I was then responsible for carrying out the mass and heat balances on the system and to look at a number of scenarios, including recycle rates, to determine the optimal process configuration.
1.1.2	Evidence of understanding of the principles of momentum, heat and mass transfer and application to problems involving flowing fluids and multiple phases.	**Example 1 (Academia):** During my degree in Mechanical Engineering, I have studied modules in Engineering Thermodynamics (GENG1053) and Heat Transfer (GENG2012) at both basic and advanced level. I have also completed a module in Fluid Mechanics (MENG2032), covering flowing fluids in different scenarios. At a more advanced level I completed a module in CFD (Computational Fluid Dynamics, MENG4009) and applied this to a small project as part of the module assessment.
1.1.3	Evidence of understanding of the principles of equilibrium and chemical thermodynamics, and application to phase behaviour, to systems with chemical reaction and to processes with heat and work transfer.	**Example 1 (Industry):** I prepared an Aspen Plus simulation for a hydrogen plant using Steam Methane Reforming technology (SMR) and natural gas as feedstock. This included a lot of background reading such as *Modelling of Chemical Kinetics and Reactor Design*: Selecting the appropriate thermodynamic packages (ie equations of state) for the different sections of the plant (considering the presence or not of water). I ensured that there was a suitably designed heater at the inlet to the plant to prevent liquid drop-out when the pressure of the natural gas feed was reduced from the pipeline (as a result of the JT effect). For the reformer and the shift reactors, I included the relevant chemical equations and provided the expected approach temperatures to equilibrium based on catalyst vendor feedback and corporate experience. I prepared different simulations with different reactor temperatures and steam: carbon ratios to optimise the design parameters. The simulation model included a hydrogen compressor to meet export pressure requirements. For the compressor I double checked the simulation results through hand calculations to validate the results for power consumption. From this work I gained a good understanding of the trade-offs while optimising SMR process parameters and effects of temperature and catalyst selection on the chemical equilibrium and undesirable side reactions. I used these learnings to develop a training manual and course for the hydrogen plan team to help new members get up the learning curve and to use as a reference resource that could be further developed and expanded. **Example 2 (Academia):** My understanding of this area comes from two sources. Firstly, through my A-level and degree studies in modules covering thermodynamics, heat transfer and material science. I have also applied these principles in my work experience in a project to determine a new route for the production of chemical RST. This was a batch process and it was necessary to find heats of reaction and rate equations in order to facilitate the design. I determined these through experiment and calculation and then was able to carry out a heat balance that tracked the reaction through time and, hence, determine the optimal cooling system required for the process. During this study it was also necessary to consider phase changes during the process and the effect on equilibrium under different conditions of temperature and pressure.

1.1.4	Evidence of understanding of the principles of chemical and/or biochemical reaction and reactor engineering.	**Example 1 (Academia):** My understanding of this area comes from my A-level studies in chemistry, as a basis, and the module in my degree in materials science. I also had to determine rate equations and apply to the design of a batch process, and, following the successful completion of this, to determining a possible route as a continuous process, which required further calculation of reactor size and configuration using the determined reaction kinetics.
1.2 – Core chemical engineering – mathematical modelling and quantitative methods		
1.2.1	Evidence of ability to apply, a range of appropriate tools such as dimensional analysis and mathematical modelling.	**Example 1 (Industry):** A number of plant closures across the site had resulted in a reduction in the utilisation of a number of cooling towers. It was proposed to transfer the cooling water supply for one of the chemical plants from one cooling tower to another: this would enable the other cooling towers to be shut down and decommissioned, providing a saving on fixed and variable costs. I was the responsible process engineer for this project. I produced a flow network model using the ABB PEL suite of process engineering programs. My inputs to the model included pipe sizes and lengths, flow requirements and pump performance data. I built in heat exchanger pressure drops to the model by using curve fitted data from polynomial regression. I used the model to simulate the performance of the cooling water network and to assess the impact of the proposed process changes. I verified the model results by performing on site checks using a portable ultrasonic flow meter and pressure gauges. These checks were also used to assess the performance of the cooling tower pumps versus their respective pump curves. I then adjusted the model to reflect my findings from the actual plant conditions. The simulation results generated by the final model provided evidence that the single cooling tower had sufficient capacity in terms of flow and pressure to support the additional chemical plant.
1.2.2	Evidence of knowledge of the role of empirical correlation and other approximate methods and ability to apply these to engineering problems.	**Example 1 (Industry):** I currently work for the Site Services technical team on site; the responsibilities of the team include providing technical support to the operational staff as well as producing process designs for a number of projects across the various utility systems. When assessing the technical and financial feasibility of a project, it is often necessary to produce a ± 40 % cost estimate for the project. As part of this, it is necessary to perform high level calculations in order to estimate equipment sizes to get an appreciation of the potential cost. As part of this, I use various chemical engineering rules of thumb such as assuming an overall heat transfer coefficient in order to estimate a heat exchanger area, or assuming an economical velocity for sizing liquid or gas pipelines. When estimating the cost of equipment, I use a range of cost estimating methods such as the six-tenths rule or equipment cost correlations. For estimating the installed cost of a project, I have used the detailed factorial method to get a total cost and then and sanity check the numbers against an overall Lang factor versus Main Plant Item (MPI) cost.

1.2.3	Evidence of competency in the use of numerical and computer methods, including commercial software, for solving chemical engineering problems (detailed knowledge of computer coding is not required).	**Example 1 (Industry):** I am proficient in the use of process simulation software such as Aspen Plus, Hysys, and ProII simulation software. Simulations I have prepared include hydrogen plants (Aspen), and gas-to-liquid plants (Hysys and ProII). These have been used as the process design basis for projects in FEED (Front End Engineering Design). Other computer methods include the use of corporate excel based spreadsheets for pipework pressure drop calculations, PSV sizing, vessel design, compressor and pump power calculations. My learnings from use of these programs is the importance of cross checking the results either with similar projects to benchmark the results (in terms of process equipment sizing), and for simulations performing manual checks to ensure proper convergence and, in particular, that mass is not lost in recycle loops (eg perform overall facility and unit manual material balances). I developed a spreadsheet for checking orifice plate pressure drop calculations to verify plant test data since the actual meter reading was suspect. This resulted in calculating a different flowrate from that reported by the control system, through using the raw pressure drop data from the instrument with the known orifice characteristics. As a result, I checked the calculation in the control system and found it to be in error. The learning from this was that the information provided by the control system cannot always be relied upon and that where possible raw data should be obtained when undertaking plant tests to enable investigation of anomalous results. **Example 2 (Industry):** I was asked to review the existing design of the relief on the 75 barg ethylene distribution system on site. The relief stream is required to protect the pipework against block in thermal expansion. Due to the operating conditions of the pipeline, the ethylene is in the supercritical phase and therefore requires a suitable methodology for determining the required relief rate and orifice area. Through my research I determined that the commonly accepted methodology for sizing supercritical reliefs is the one presented in *Rigorously Size Relief Valves for Supercritical Fluids* by Ryan Ouderkirk. This method requires physical property data over a range of conditions as well as the solution of the isentropic nozzle mass flux equation for a number of time steps. As a result, this calculation is very laborious and time consuming to perform by hand. Instead, I conducted research into potential software that could be used to perform the same calculations. I found that there is an in-built tool in Aspen HYSYS for sizing safety relief devices; this tool uses the exact same methodology described by Ryan Ouderkirk for sizing supercritical reliefs. I had to select a suitable fluid properties package in order to obtain accurate physical properties data for the simulation. I used the safety valve sizing tool and configured the model to select the appropriate methodology and parameters to perform the calculation. I verified the results completing sample manual calculations.
1.3 – Core chemical engineering – process and product technology		
1.3.1		Examples coming soon
1.3.2		Examples coming soon
1.3.1		Examples coming soon

1.4 – Core chemical engineering – systems		
1.4.1	Evidence of understanding of the principles of batch and continuous operation and criteria for process selection.	**Example 1 (Academia):** I am involved in the teaching of batch and continuous operations in a second-year module to undergraduate students based on my previous experience during my PhD. My doctoral research work involved selecting appropriate materials of construction for pilot-scale fermentation reactions and required control systems to maintain temperature, pH, flow and pressure. For this I read many research publications and also textbooks on bioreactor technology, including *Biochemical Engineering* by Blanch and Clark. The research was part-funded by an industrial company and required me to give a number of presentations to the company which advised them on the approach needed for commercial scale-up. My teaching covers various forms of batch and continuous operations including mixing, reactions and separation. As a recipient of a recent teaching fellowship, I have been able to extend my knowledge and understanding in operations and practice through a two-month secondment to the local refinery and work-shadowing professional engineers. My contribution was noted through the successful implementation of a major plant modification to a distillation column to adjust new feedstock compositions to meet defined product specifications.
1.4.2	Evidence of understanding of the inter-dependence of elements of a complex system and ability to synthesise a conceptual process by combining steps into a sequence and applying analysis techniques such as balances (mass, energy) and pinch.	**Example 1 (Academia):** Prior to my current position as an academic, I was involved in a 12-month placement with a local waste treatment company. This involved advising the company on the installation of a new novel batch alkali digester which used NaOH and KOH to digest protein-based waste from a local abattoir to eliminate harmful prion proteins. It was my responsibility to complete an audit of the anaerobic digester which was installed on site. This involved carrying out mass and energy balances to determine the required levels of materials needed and caustic required. As a novel process, I was also responsible for the technical evaluation of the process which led to the preparation of an operators' manual for the safe and effective operation of the process. The output from the digester formed the feed to another part of the overall or integrated waste treatment. I worked directly with the shift managers on site to advise them of operations.
1.4.3	Evidence of ability to determine the dynamic response to changes in a process, and ability to design measurement and control functions and determine their performance.	**Example 1 (Industry):** I performed a dynamic process control study for a compression system considering a range of process upset conditions including sudden opening/closing of inlet and outlet valves and increased suction pressures to the unit. This was to determine how the pressures within the system would develop considering a range of different scenarios and if the currently installed relief valves were sized sufficiently to handle the load. This was required due to a recent upgrade of the compressors internals that changed the compressor curve. The model included incorporating all the control system functions around the compressor and adjoining process. The result of this study included recommended changes to trip set points and the results used as input to a LOPA (Layers of Protection Analysis). **Example 2 (Academia):** As a lecturer, I have responsibility for delivering a practical class which is based on a live demonstration process. This involves a laboratory demonstration control room linked a distillation column that separates methanol from water. I supervise groups of four students at a time in the control room which comprises four screens depicting the flowsheet and control system with alarms, and linked to the continuously fed distillation column in the laboratory outside. Students gain an appreciation of the live operation and can visually appreciate the impact of their decisions to make appropriate adjustments to the set points. We use the textbook by Pollard *Process Control* as the basis for the course. My class is structured around encouraging the students to appreciate and understand the effect of process disturbances and the ability to control them. As examples, I create step changes in flow to the column or ramped decreases in condenser temperature which affect the behaviour of the column. This is a form of simulation typically encountered in practice. The students are required to present their work as a group at the end of the practical session with me that links theory to practice. I recently received a teaching award for my innovation in teaching based on this.

1.5 – Core chemical engineering – process safety		
1.5.1	Evidence of: ■ ability to identify the principal hazard sources in chemical and related processes (including biological hazards); ■ knowledge of the principles of safety and loss prevention and their application for inherently safe design; ■ knowledge of the principles of risk assessment and of safety management, and ability to apply techniques for the assessment and abatement of process and product hazards; and ■ ability to apply systematic methods for identifying process hazards (eg HAZOP) and for assessing the range of consequences (eg impact on people, environment, reputation, financial).	**Example 1 (Industry):** For the XYZ project I performed a HAZID and Process Safety Review based on the Process Flow Diagrams and material balances available. As the project matured, I was the process engineer in the HAZOP for the project and was responsible for closing out actions. In addition to these reviews, I prepared the process information required for, and participated in the area classification reviews. I led a review of the ABC facilities to assess the risks and compliance against corporate process safety requirements. This included assessing risks against common process safety hazards highlighted in major accidents within the process industries. These included safe siting of portable buildings, overfilling of tanks, liquid release from vents, exposure to low temperatures (embrittlement), alarm management, toxic gas, amongst others. Following the review, I compiled a report with findings and proposed actions to address the gaps identified. **Example 2 (Academia):** My knowledge in this area comes mainly from my industrial experience. However, during my degree I carried out extensive laboratory work and was instructed on and had to abide by the safety regulations of the laboratory, including procedures and protective clothing. There was a hazard assessment for all my laboratory experiments and for my final year research project I had to write the hazard assessment for my project in association with my supervisor. In my industrial experience I have carried out some laboratory work and been involved in process development and this has required a full understanding of the hazards associated with chemicals and related processes. How to handle the chemicals from receipt to use and any special precautions that need to be taken. All to be embedded in a comprehensive hazard and risk assessment. I have been involved with process design and modifications for both batch and continuous processes. I have worked alongside experienced chemical engineers and learned and applied the principles of inherent safety. For example, in one of my earlier projects we were looking for a different product route in order to reduce the risk from the chemicals used as raw materials. I have been involved in risk assessments and safety audits on existing chemical processes. I have attended HAZOP sessions related to the projects I have worked on. I have attended the following training programmes: XXXXX HAZOP; XXXXX Safe handling and disposal of chemicals; XXXXX Safety in the workplace.
1.6 – Core chemical engineering – sustainability and economics		
1.6.1	Evidence of understanding of the principles of sustainability (environmental, social and economic) and ability to apply techniques for analysing the interaction of process, product and plant with the environment and minimising adverse impacts.	**Example 1 (Industry):** I conducted a noise survey around the fenceline of a new facility to ensure that the noise levels were within the design limits. For the XYZ project, I provided emission data to the environmental team to model the dispersion from a fired heater stack to ensure that the design met the environmental standards for the project.
1.6.2	Evidence of ability to apply the principles of process, plant and project economics.	**Example 1 (Industry):** For a several different concepts for an offshore oil project I prepared cost estimates using the corporate software tool, estimated operating costs and used the oil production profiles as inputs for the economic model. I then used a spreadsheet model to assess the Net Present Value (NPV), Internal Rate of Return (IRR) and Value to Investment Ratio (VIR) for each concept. Using this data, I was able to propose the optimal economic concept for the project.

2 – Chemical engineering practice		
2.1	Evidence of knowledge and understanding of laboratory (or larger scale) practice, and ability to operate bench- (or larger) scale chemical engineering equipment.	**Example 1 (Industry):** As part of the chemical engineering laboratory work at university I undertook an experiment to look at pressure drop in fluidised beds for various flowrates. This included the use of bench scale fluidised bed apparatus. I was awarded 18/20 for my work, analysis and report. During the commissioning of an air separation unit I was responsible for operating the cryogenic argon system. This system (included distillation column) was very sensitive to upsets within the rest of the plant and as a result required careful manual operational intervention during start-up/initial operation to maintain stability until the control loops were correctly tuned.
2.2	Evidence of ability to undertake well-planned experimental or plant work and to interpret, analyse and report on experimental or plant data.	**Example 1 (Industry):** I prepared a plant test procedure for an amine plant to remove H_2S and CO_2 from natural gas. This included careful review of the P&IDs to assess and document the required instrumentation readings to be taken, and where necessary temporary instrumentation to be installed. I led the performance test, ensuring that prior to testing all instruments were properly calibrated. The test included a gamma scan of the absorber and regenerator columns to establish liquid loadings on distributor trays and packing to identify when the columns were entering flooding. After the test, I analysed the data using spreadsheet models and prepared a report. An outcome from the test was that I identified the columns were flooding at lower levels than design (requiring further investigation) and that one of the flowmeters in the control system readout had been improperly labelled as it was reporting Am^3/h rather than Sm^3/h.
2.3	Evidence of ability to find and apply, with judgement, information from technical literature and other sources.	**Example 1 (Industry):** I wrote a guideline on gas plant design including descriptions on the different technologies that can be applied for different functional requirements. This included inlet facilities (slug catchers, etc), acid gas removal, dehydration, mercury removal, hydrocarbon dew-pointing, fractionation, liquid treating and compression. This required me to research standard texts (GPSA manual, Campbell, etc), perform literature searches (*Oil and Gas Journal*, hydrocarbon processing, etc), vendor/licensor literature as well as in-house data. The guideline included several metrics including process performance and cost estimates which required critical assessment of the available information to ensure that data from the various sources were assessed on a comparable basis.
2.4	Evidence of knowledge and understanding of materials science and its application to the selection of materials of construction, corrosion protection etc.	**Example 1 (Industry):** As part of my university degree the course included modules on materials of containment, focussing on the correct selection of materials for different applications considering the fluid type and process conditions. This included assessment on corrosion and failure mechanisms (such as stress corrosion cracking, hydrogen embrittlement, work hardening, etc). As the responsible process engineer for an amine unit (to remove CO_2 and H_2S) I worked with the project metallurgist to develop the material selection diagrams and material selection report for the project. Due to moderate temperatures and the risk of chlorides within the process (carried over from formation water), alternatives to stainless steels (super duplex or titanium) were used in parts of the plant subject to corrosion from wet CO_2/H_2S to design out or reduce the risk of chloride stress corrosion cracking.
2.5	Evidence of a basic understanding of relevant elements from engineering disciplines commonly associated with chemical engineering, such as electrical power and motors; microelectronics; mechanics of pressure vessels; structural mechanics.	**Example 1 (Industry):** My university degree included modules on Materials (including mechanical design), and Civil Engineering within the first year [X% and Y% respectively]. During my graduate development I had a placement in the mechanical design group where I prepared standard spreadsheets for the design of pressure vessels and supporting structures. I was also able to witness the manufacturing and testing of these vessels within our fabrication facility. In understanding the implications of adding electrical equipment (for compressors, pumps, etc) to existing process plant, I have gained an understanding of basic electrical engineering concepts and how to read single line diagrams.

3 – Chemical engineering design and design practice		
3.1	Evidence of understanding of the importance of identifying the objectives and context of the design in terms of: business requirements; technical requirements; sustainable development; safety, health and environmental issues; appreciation of public perception and concerns.	**Example 1 (Industry):** A change in raw material produced a reduced rate of reaction, leading to production rate decreases and an increased risk of unreacted material being vented to atmosphere. Following successful lab trials by others utilising Compound X (CX) oxidising agent added to the new raw material, I was asked to be the process design engineer for a system to install an automated dosing system on plant for 4x batch reactors. I estimated the annual volume and purchase cost of CX vs the cost of lost production (OPEX) which helped justify the proposed project's business case. I also produced calculations showing the predicted reduction in emissions to atmosphere to be used in the business case. I obtained preliminary costs of new equipment to assist in collating early order of cost CAPEX estimates. I was the process engineering representative in the subsequent HAZOPS and Management of Change reviews, and assisted in LOPA study. I provided the Site Safety Manager with MSDS information on Compound X and on the proposed storage quantities to assist in notification to HSE regarding Hazardous Substances Consent.
3.2	Evidence of understanding of design as an open-ended process, lacking a pre-determined solution, which requires, synthesis, innovation and creativity; choices on the basis of incomplete and contradictory information; decision making; working with constraints and multiple objectives; justification of choices and decisions taken.	**Example 1 (Industry):** I liaised with other production sites in my company and identified that another location already used a similar oxidising agent to CX, Compound Y (CY). I arranged a site visit to see how they handled the receipt of the CY, arranged its storage and its transfer to plant. I then saw how they dosed CY into the plant process, and how it was automated. I built this learning into my Process Flow Diagram (PFD) development. I used CX manufacturer's MSDS to determine the appropriate materials of construction, and importantly, what materials to avoid, in the system design. I also discovered that CX, unlike CY, needs to be kept above 15°C to remain liquid, and so identified that the storage vessel, pumping equipment, pipework and valves would need to be heat traced to stop CX solidifying between batch dosing. In talking to more experienced engineers from other disciplines, I discovered electric tracing was preferable to steam as (i) temperature can be controlled (ii) steam needs condensate systems and is prone to leaks (iii) electric is cheaper to install and maintain. I also determined that thermal relief would be needed for CX for blocked-in sections. I included all of these requirements in the P&ID I produced from the original PFD.
3.3	Evidence of ability to deploy chemical engineering knowledge, using rigorous calculation and results analysis, to develop a design and with appropriate checks on its feasibility and realisability.	**Example 1 (Industry):** I calculated the daily use of CX, clarified the quantities and frequency of supplies from manufacturer and non-delivery durations (eg weekends, national holidays) in order to determine the minimum storage inventory required. I then contacted suppliers of bespoke storage units to determine they could provide a large storage cabinet meeting requirements, eg capacity, temperature controlled, alarms if temperature too high/low, integral bund, lockable, suitable for outdoor use etc. I produced process data sheets for dosing pumps based on dosing duration and pressure drop across the systems, and for the local storage vessel. I provided data sheets for level, temperature and pressure instruments and alarms. I also calculated the size of thermal reliefs and for the relief lid on the storage vessel. Once preliminary piping arrangements were available, I calculated the lengths and volumes of pipework, which enabled me to calculate the heat input needed from the electric tracing. All calculations were checked by the senior process engineer.

3.4	Evidence of ability to take a systems approach to design appreciating: complexity; interaction; integration.	**Example 1 (Industry):** I worked with the AutoCAD designer to ensure that my preliminary hand-drawn P&ID was transferred correctly to AutoCAD. This was then updated as the design developed and detail added; I checked it before each revision was issued. This included such things as ensuring that the correct instrument labels were shown, correct types of valves were shown, requirements for no lutes included, actions from HAZOPs were included. I reviewed the preliminary equipment layout and pipework design with the mechanical project engineer to ensure that they met process design intent, such as no lutes, manual valves were in accessible locations, reliefs were directed to safe locations, pumps were located in adequately sized bunds. I worked with the E&I engineer to determine the Area Classification (zoning) requirements due to CX and the impact on electrical equipment, eg pump motors, instruments. We also worked together to ensure that they understood my instrument and trace heating data sheets so that the correct items could be specified and procured. I specified the initial control philosophy to achieve automated dosing, which determined how many valves had to be automated, where an operator would need to make manual interventions etc. I then worked with the software engineer who was to update the DCS configuration to check that the operating requirements would be met. I was then part of the software testing team.

Part B – Advanced chemical engineering

4.1 – Advanced chemical engineering depth

4.1	Candidates should provide evidence of attainment of advanced chemical engineering depth according to the criteria listed above in at least one of the subjects below: ■ chemical engineering fundamentals (thermodynamics, fluid flow, chemical/biochemical reactors, etc); ■ modelling and quantitative methods process and product technology (processes and process equipment design and performance); ■ chemical engineering systems (batch/continuous, integration, control, dynamics etc); ■ process safety; ■ sustainability and process economics	**Example 1 (Industry):** Having completed both in-house and external training on specialised design software, I joined the company's design team. The team has responsibility for the design of new production units as well as reconditioning existing units to meet regulatory compliance in terms of quality assurance and emissions. The team comprises six professional engineers including four chartered engineers and headed by a chartered mechanical engineer. With personal responsibilities within the team for the chemical flowsheeting including detailed mass and energy balances, I use my knowledge of thermodynamics as well as the chemical reactor kinetics and specialist texts such as *Process Flowsheeting* by A. W. Westerberg. This is often challenging as detailed data is unavailable which requires innovative approaches to solve problems. This ranges from using advanced models from the latest published literature to complex statistical extrapolation techniques. Increasingly, the modelling uses sophisticated software modelling of solid-solid interactions at the molecular interface, which is based on sophisticated thermodynamics models. I am also responsible to testing and validating the data with the design. **Example 2 (Academia):** As an early career academic, I have responsibility for the delivery of three modules in Chemical Thermodynamics (ChE6002), Advanced Fluid Dynamics (ChE6005) and Advanced Chemical Reaction Engineering (ChE4012) on the Advanced Chemical Engineering master's programme. This involves lectures, tutorials and practical classes covering advanced computational modelling techniques as well as novel reactor design applied to the oil, gas and nuclear industries. I am responsible for the module leadership of two of the modules which involves curriculum development and working with senior colleagues who also contribute to the module. As such I have had to attain all of the relevant knowledge and understanding associated with these modules, which are all rated as advanced chemical engineering depth. I am also responsible for introducing innovations in teaching which includes using a flipped classroom approach as well as developing an online virtual laboratory. I also engage with the Department's Industrial Advisory Board and use invited industrials to present real-life applications particularly in terms of chemical reactor operation. I have supplemented my own experience with two periods of one week shadowing professional engineers at the local refinery. This has enabled me to teach effectively both theory and practice to undergraduate students.

4.2 – Advanced chemical engineering breadth		
4.2.1	Candidates should provide evidence of attainment of advanced understanding of chemical engineering in its broadest sense according to the criteria listed above.	**Example 1 (Industry):** I have wider responsibility within the company for the management of effluent monitoring and auditing. This is an essential and legal requirement of the company to ensure that it meets regulatory compliance. As the lead in a team of four, and as the only engineer, I have responsibility for ensuring the data is available and reliable, and making recommendations to advise the company on how to meet compliance where necessary. This involves analysing considerable amounts of complex data that includes flows, temperatures and concentrations of solids, liquids, vapours and gases. A data visualisation approach is used to identify where there are concerns which requires competences in advanced statistical modelling for which I have used *Understanding Advanced Statistical Methods* by Westfall and Henning as well as other books and courses. I also have a firm understanding to regulatory procedures applied to waste treatment, associated environmental pollution abatement systems as well as the law associated with corporate responsibility. I have received regular external training by the regulator and recently completed a module on regulatory compliance passing with distinction. My work is currently overseen by a chartered engineer and I report my work every quarter to the company's board. **Example 2 (Academia):** I have responsibility within the Faculty of Engineering for the delivery of a postgraduate master's module in Process Systems Modelling (ChE6015). This is delivered to students from a wide range of engineering backgrounds and includes chemical engineers as well as other engineering disciplines. The module is presented in the form of workshops and presentations covering approaches to process systems applied across a wide range of industries. It requires a good working knowledge of mathematics and involves computational modelling techniques applied to real data. As the lead for the module, I have been responsible for curriculum development and assessment, for which I have adopted a new textbook *Modelling and Simulation of Chemical Process Systems* by Nayef Ghasem. Module development has also involved working with industrialists as well as fellow engineers across the faculty to incorporate a wide range of examples and applications. These include applications of predictive information for decision support in process innovation, design and operation with the aim of creating faster and safer decisions by reducing uncertainty from more traditional process simulations. One such example is the approach used to optimise and improve the process economics of a complex multi-tubular catalytic reactors recently installed at the local refinery. Using my contacts with the IChemE Special Interest Group, I arrange for site visits to the refinery for the students to gain an appreciation of both the problem and solution in practice.

4.3 – Advanced chemical engineering practice		
4.3.1	Evidence of: ■ awareness of developments in relevant technologies and their potential impact on current practice and its limitations; ■ having undertaken development and/or research project work that provides opportunities for: application of investigative methods; originality and experience in dealing with uncertainty and new concepts and/or applications; ■ having communicated the outcomes of the project work in a professional manner that may include: professional reports; modified operating instructions/manuals; thesis; oral presentations; publications, etc.	**Example 1 (Industry):** On joining the company after graduating four years ago, I been actively involved in working on prospective and future pipeline projects. These are intended to replace existing pipelines which supply feed materials and products to storage with advanced control measurement systems. My responsibility has been the design and development of these control systems and includes procurement, installation and commissioning with a team of technicians. This has involved identifying and implementing the latest design of control system which can be operated remotely and in harsh environment conditions across a range of flow conditions capable of handling toxic materials. To achieve this, I have formed a close relationship with academics from the faculty of engineering at the local university to assist me with the research and development, and includes supporting postgraduate students specialising in control engineering. This has included contributing to research seminars on a regular basis and well as supporting student placements within the company for which I am the industrial supervisor. I have access to databases such as Scopus, from which I download and read the latest research articles. **Example 2 (Academia):** I joined the university as a lecturer after completing my postdoctorate. I have continued to develop my experimental laboratory research as an independent researcher. I have extended my specialist area into advanced and novel reactor simulation and design, and, in particular, biochemical reactor development. I have obtained both internal and external funding to establish equipment and funding for two PhD students and, to date, had one successful completion from an industry-funded studentship. I am also supported by three MSc students and four final year MEng Chemical Engineering students. I have been responsible for the design and development of novel reactors and have supervised a team of workshop technicians to fabricate a range of novel pilot-scale bioreactors. This has required the application of advanced materials and also the use of the 3D printing which is available within the faculty. The output of the research group has been the publication of four research papers in four years in internationally recognised journals. I have also presented my research work at two international research conferences which has led to attracting a number of international partners interested in developing this work. This has included being invited to join an international Horizon2020 application led by leading researchers at a French institution.

<table>
<tr><th colspan="3">4.4 – Advanced chemical engineering design practice</th></tr>
<tr><td>4.4.1</td><td>Evidence of the ability to work with information that may be incomplete or uncertain, quantify the effect of this on the design and, where appropriate, use theory or experimental research to mitigate deficiencies.</td><td rowspan="3">Example 1 (Industry):
I have been responsible for the design of a number of specialist unit operations which have been built and successfully operated within the company's manufacturing plant. This has included the design of a novel membrane bioreactor used to reduce the concentration of harmful substances produced in the effluence of the company's internal reprocessing unit. Working within a team of five process engineers, the design involved the sizing of process plant equipment based on the flowsheeting requirements of flows, temperature, pressures and concentrations. The complexity in the design was based on the unsteady state nature of the flows and the variability of the concentrations in the effluent. Within the team, it was my responsibility to model the process dynamics to predict the performance of the bioreactor. This involved computational modelling of the bioreactor under both steady state and dynamic conditions using available data and where incomplete, the use of predicted plant data from thermodynamic models. I was also responsibility for writing the operating instructions including start-up and shut-down procedures as well as maintenance manuals detailing how to replace the membrane filters. After the bioreactor was constructed and installed, I was seconded to the team responsible for commissioning the unit to ensure that it was able to meet the specifications detailed in the design safety report. This involved using inactive materials prior to the unit being approved to go live.

Example 2 (Academia):
I am responsible for supervising chemical engineering design project groups in the final year of the MEng Chemical Engineering degree programme. This involves supervising and assessing two groups of five students each. Spanning 12 weeks this involves the complete design of a chemical process. The design project changes each year and is always topical, current and relevant. For example, the recent project concerns the design of a biodiesel production facility using waste cooking oils. It is my responsibility to define the scope of the project with a design brief for which the students are required to successfully complete the design that includes flowsheets, mass and energy balances as well as equipment design. It also includes process economics, SHE, ethics, sustainability, start-up and shut down procedures. I support the students with a steady state flowsheet simulation using Aspen HYSYS and PRO/II. In terms of the advanced chemical engineering aspects of design, the brief does not present a full set of data and students are required to use their initiative and skills to obtain missing data. I also supervise the students to complete dynamic control of a continuously operating chemical reactor subjected to simulated process interruptions. Students are required to apply their knowledge of advanced control theory to optimise the control. I use my network of contacts in industry through the local IChemE Members Group to meet with the students towards the end of their project. The project ends with the submission of the project and presentation to invited industrialists.</td></tr>
<tr><td>4.4.2</td><td>Evidence of having achieved, within a design project(s) some of the ‘depth’ and ‘breadth’ (see pages 63 and 64) outcomes of advanced chemical engineering described in the preamble, eg:
- detailed design of control systems based on process dynamics;
- design and operation aspects of start-up and shut-down;
- design of a process for a novel product for which data are unreliable or limited;
- environmental impact and Life Cycle Analysis;
- evaluation of financial and other risks.</td></tr>
<tr><td>4.4.3</td><td>Evidence of ability to apply and adapt design processes and methodologies in unfamiliar situations.</td></tr>
</table>

Appendix H

Virtual interviews

a. If your Technical Report Questionnaire Interview (TRQI) or Professional Review Interview is to be held online, you will be advised of this early in your application process. IChemE is very experienced in holding virtual interviews, and our reviewers are trained in good practice and in leading interviews using Microsoft Teams.

Before the interview

b. Joining a virtual meeting is straightforward – either via a browser or the Microsoft Teams app. Where the app is installed, it will open automatically as soon as the link is clicked. If in doubt about your internet connection or technical compatibility, please refer to the following advice:

- hardware requirements;
- browser compatibility;
- bandwidth requirements.

c. These should be checked well in advance of the interview to allow time for fixing any issues identified and to arrange a test session prior to the day of the interview.

d. Test sessions may be requested in advance of the interview. If there is any concern around bandwidth or firewalls blocking access to the web meeting, it is strongly advised that a test session is arranged – please contact applications@icheme.org to arrange this.

e. Well in advance of the interview, you must consider the location you will use for the interview – it should be in a quiet room where there are no distractions.

f. IT issues during the interview may mean that the interview will run over its allotted time and so you should ensure that you allow for this eventually in your diary and the booking/use of any room where you will join the interview from.

Joining the interview

g. Mobile phones should be switched off or put on silent and placed out of reach.

h. Close all applications on your computer that are not required. Use of search engines or other applications during the interview is not permitted.

i. A headset with inbuilt microphone should be used where possible, to minimise background noise.

j. Please log into the weblink at the allotted time, and not earlier, as the professional reviewers may be finalising their preparations.

During the interview

k. We expect all parties to maintain video and audio throughout the whole interview. We recognise, however, that IT and bandwidth issues may sometimes cause issues for one or more participants, and so the following principles and guidance should be applied.

l. Any shortcoming in audio or video from all participants should be identified, declared, and discussed before the interview formally starts. All parties should agree to either proceed or to reschedule based on a collective assessment of the situation.

m. It is absolutely essential that you can be seen on video throughout the interview. The professional reviewers will confirm your identity against the photo ID that you provided as part of the application process. The professional reviewers also need to confirm that nobody else is in the room with you and that you are not getting any assistance in any way.

n. If it is not possible for you to be on video throughout the interview, then the interview will be aborted and rearranged. You should contact the membership staff in the appropriate IChemE office to rearrange the interview.

o. If video/audio from any of the parties is lost during the interview, then the interview should be paused whilst the parties concerned attempt to re-establish video and/or audio. If you have technical difficulties, and where the interview is being held during working hours, please contact membership staff in the appropriate IChemE office.

p. Persistent loss of audio from any one of the parties will require the interview to be aborted and rearranged.

q. Loss of video from one professional reviewer is not a situation where the interview must be aborted and rearranged. However, in the event of a loss of video of both professional reviewers, even if their audio is unaffected, the interview should be paused and all parties should have a short discussion to decide when to reconvene (if expect only a short or minor delay of the loss of video) or to rearrange the interview for a later date.

r. As the interviewee, you are not under any obligation to agree to continue the interview if you feel that the loss of video, by one of the professional reviewers, will be detrimental to your interview performance.

s. All parties should speak slowly and clearly and actively listen. Allowances for minor time lapses caused by internet connections should be made, and it is important to indicate once a question/response has been completed so that the interview can progress efficiently.

t. At the end of the interview, it is important for all participants to have a brief review of the overall video/audio quality throughout the interview. All participants should be able to agree that the interview was conducted without any interference or interruption that might have impeded the process adversely.

After the interview

u. Once the interview is complete, please leave the Microsoft Teams meeting promptly to allow the professional reviewers to conduct their post interview discussion.

Contact us for further information

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