CENG – AHEP SYNOPSIS FORMS

The purpose of the Technical Report is to demonstrate that you have acquired the equivalent level of technical knowledge and understanding of scientific and engineering principles to the same level as those who fulfil the academic benchmark i.e. an integrated Master's degree, as described in the Accreditation of Higher Education Programmes 4th edition (AHEP) document

The AHEP document forms part of the standard used by the UK engineering profession to assess the competence and commitment of individual engineers and technicians. It was developed collaboratively, in consultation with engineers representing the breadth of the profession: from industry, academia and many different disciplines and specialisms.

The criteria against which candidates are assessed against in their Technical Report application are categorised under five engineering-specific areas of learning, as outlined in AHEP. Please refer to the M1-M18 learning outcomes on pages 32-37 for further guidance.

1) Science and mathematics
2) Engineering analysis
3) Design and innovation
4) The engineer and society
5) Engineering practice

The AHEP Synopsis Forms must describe *clearly and concisely* how you propose to fulfil each of these learning outcomes within your full Technical Report. To assist you, the sub-categories for each of the general learning outcomes are summarised at the top of each form.

The forms should not exceed 1500 words in total.

You and your sponsor should ensure that your Synopsis Forms are grammatically correct and free of spelling mistakes.

Application Process

Your Stage 1 Technical Report application should consist of the following documentation:

- A completed Stage 1 Technical Report Application Form
- A copy of the initial assessment e-mail from CIHT
- Your AHEP Synopsis Forms (1500 words max)
- A copy of your CV. This should cover your relevant academic qualifications as well as your work experience to date.
- CPD record (a minimum of 25 hours per year for **each** of the two years prior to the date of your application)

Your Stage 1 Technical Report submission can be submitted at any time throughout the year and should be sent to education@ciht.org.uk for an administrative check, **as one continuous PDF file**. Once an administrative check has been completed, you will be provided with further details on how to pay the Stage 1 Assessment fee.

CIHT: AHEP SYNOPSIS FORM 1 (CEng)

Number of words used for AHEP Synopsis Form 1: xxx

SCIENCE AND MATHEMATICS

The study of engineering requires a substantial grounding in engineering principles, science and mathematics commensurate with the level of study.

- **M1 – Science, mathematics and engineering principles:** Apply a comprehensive knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Much of the knowledge will be at the forefront of the particular subject of study and informed by a critical awareness of new developments and the wider context of engineering.

Please outline the evidence that you propose to use in your Technical Report to demonstrate how you fulfil this learning outcome.

- I will discuss aspects of civil engineering principles that are underpinned by both science and maths by showing my design considerations for road schemes, formulae and calculations for the geometric road and drainage design as well as scientific properties of the construction materials used.

- I'll discuss and demonstrate manual calculations for the volume of earthworks required for an embankment and the drainage at the toe of the slope.

- I'll discuss engineering principles behind CBR values and how I interpreted this data into calculations on foundation depth, type and materials for a supporting embankment.

- I'll cover my experience testing materials in the Laboratory, tests I carried out, methods, the standards applied, the calibration requirements and the formula I used to process the results. I will explain how I applied what I learned from these tests to my role in the Consultancy.

- What I learned about the principles and science behind the salt used for winter service gritting. I will explain the considerations when determining spread rate, the scientific and environmental parameters and discuss alternative de-icing materials including the advantages and disadvantages.

CIHT: AHEP SYNOPSIS FORM 2 (CEng)

Number of words used for AHEP Synopsis Form 2: xxx

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

- **M2 – Problem Analysis:** Formulate and analyse complex problems to reach substantiated conclusions. This will involve evaluating available data using first principles of mathematics, statistics, natural science and engineering principles, and using engineering judgment to work with information that may be uncertain or incomplete, discussing the limitations of the techniques employed.
- **M3 – Analytical tools and techniques:** Select and apply appropriate computational and analytical techniques to model complex problems, discussing the limitations of the techniques employed.
- **M4 – Technical Literature:** Select and critically evaluate technical literature and other sources of information to solve complex problems.

Please outline the evidence that you propose to use in your Technical Report to demonstrate how you fulfil this learning outcome.

Problem Analysis – I'll talk about carrying out emergency road repairs to a verge collapse site. How I navigated the issue of the collapse of a retaining wall supporting the road and the diversion of a watercourse to allow for the works. I'll cover the design solution involving formation of a supporting embankment, drainage design, VRS assessment and the replacement of 2 existing box culverts and the environmental considerations with the watercourse.
- I'll discuss ground investigations identifying poor ground conditions, CBR values and how I interpreted this data into calculations on foundation depth and materials including the options available when the CBR value is less than 2.5% including geogrid uses and limitations.

Analytical tools and techniques – I will cover techniques used when building up a new embankment involving compaction of the material in layers. And techniques used in road surfacing with asphalt materials including tying into existing pavement.
- I'll talk about trial holes to assess soil type and groundwater conditions to determine depth of foundation
- I'll discuss the method to test asphalt materials and advantages and disadvantages I learned about asphalt materials.
- I'll talk about the skid resistance test by a road survey vehicle and its uses and limitations.

Technical Literature – I'll delve into the sources of information I used in geometric design and material choice utilising the DMRB, Guidance Documents and Standards for Highway Works and discuss my decision making process for material type in poor ground conditions.
- I'll explain how I used the MCHW to critically evaluate Contract Documents for new term contracts.

CIHT: AHEP SYNOPSIS FORM 3 (CEng)

Number of words used for AHEP Synopsis Form 3: xxx

DESIGN AND 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 level of study.

- **M5 – Design:** Design solutions for complex problems that evidence some originality and meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health and safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards.
- **M6 – Integrated/systems approach** – Apply an integrated or systems approach to the solution of complex problems.

Please outline the evidence that you propose to use in your Technical Report to demonstrate how you fulfil this learning outcome.

Design
- I'll discuss my design solution created on MX and AutoCAD to a verge collapse including the collapse of a retaining wall, how I diverted a watercourse to accommodate the works, the design of the replacement culvert and the environmental considerations to the watercourse. I'll talk about the recycled materials used to make up the embankment and support the road, the VRS design and drainage design including the application of SUDS. I'll discuss the Health and safety considerations including my Designer's Safety Analysis and how the CDM Regulations applied to my role. I'll cover how I estimated the cost of the scheme and when I referred to the contract documents on site. I'll explain the Scheme Design Overview where I reference standards, guidance documents and societal benefits.
- I'll discuss how I designed an Invasive Species App on the ESRI platform to enable the geographical logging of invasive plant species along watercourses. I will explain where the idea came from, how I began to design the app with relevant specialist input, the environmental benefits, how it integrated it with NBN Atlas so they could benefit from the data and how I completed the cycle by designing an additional App to track the treatment of invasive species.

Integrated systems approach – I'll talk about how I designed a system to record invasive species along watercourses, how I integrated the system with NBN Atlas so we can easily share that data with them and how I completed the cycle by designing a separate app for the treatment of invasive species.
- I'll discuss my input into digitising Grille Inspections, introducing the new process to staff, my audit reports of the new system, results and my recommendations for improvement.

CIHT: AHEP SYNOPSIS FORM 4 (CEng)

Number of words used for AHEP Synopsis Form 4: xxx

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.

- **M7 – Sustainability:** Evaluate the environmental and societal impact of solutions to complex problems (to include the entire lifecycle of a product or process) and minimise adverse impacts.
- **M8 – Ethics:** Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.
- **M9 – Risk:** Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity.
- **M10 – Security:** Adopt a holistic and proportionate approach to the mitigation of security risks.
- **M11 – Equality, diversity and inclusion:** Adopt an inclusive approach to engineering practice and recognise the responsibilities, benefits and importance of supporting equality, diversity and inclusion.

Please outline the evidence that you propose to use in your Technical Report to demonstrate how you fulfil this learning outcome.

Sustainability – I'll discuss how I selected a recycled material for building a supporting embankment on a verge collapse scheme, its properties and environmental benefits.
- I'll explain the inclusion of SUDS in my design of an embankment.
- I'll discuss the use of Geogrids as mechanical stabilisation of road foundation, impact on road pavement life, maintenance budget and what environmental benefits they can offer.

Ethics – I'll talk about interviewing candidates for an external recruitment board via video call. The professional codes of conduct I was instructed to abide by in this scenario and how I resolved arising issues.

Risk – The Activity Safety Controls we have in my workplace. An example of one I carried out on my staff members, the hazards identified and the control measures.

Security – The purpose of the Business Impact Assessment and Data Protection Impact Assessment that I carried out when setting up the Grille Inspection App and the security considerations.
I'll talk about the National Protocol for the handling of reservoir information and how that applies to my job.

Equality, diversity and inclusion – My input into the creation of the Appendix 1/73 Sustainability Requirements for a contract covering the targeted recruitment and training for the contract, the requirement to work with job search, education and training providers to provide workplace visits and vocational talks. I will also talk about the inclusion and diversity requirements for the Contractor and the principles behind this.
- My experience as the Chairperson for a recruitment campaign.
- The purpose of an Equality of Opportunity Screening Analysis and Rural Needs Impact Assessment and I when I used them.

CIHT: AHEP SYNOPSIS FORM 5 (CEng)

Number of words used for AHEP Synopsis Form 5: xxx

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.

- **M12 – Practical and workshop skills:** Use practical laboratory and workshop skills to investigate complex problems.
- **M13 – Materials, equipment, technologies and processes:** Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations.
- **M14 – Quality management:** Discuss the role of quality management systems and continuous improvement in the context of complex problems.
- **M15 – Engineering and project management:** Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights.
- **M16 – Teamwork:** Function effectively as an individual, and as a member or leader of a team. Evaluate effectiveness of own and team performance.
- **M17 – Communication:** Communicate effectively on complex engineering matters with technical and non-technical audiences, evaluating the effectiveness of the methods used.
- **M18 – Lifelong learning:** Plan and record self-learning and development as the foundation for lifelong learning/CPD.

Please outline the evidence that you propose to use in your Technical Report to demonstrate how you fulfil this learning outcome.

Practical and Workshop skills – I'll cover my experience testing materials in the Laboratory, tests I carried out, methods, the standards applied, the calibration requirements and the formula I used to process the results.

Materials, equipment, technologies and processes – I'll discuss my role into digitising grille inspections and the new processes introduced. Its successes and limitations and how I'm actively trying to improve the system.
- How I would select survey equipment based on the job type and pro and cons of GPS versus total station.
- How I selected the fill material for a verge collapse road repair, its properties and environmental benefits and the inclusion of SUDS in my design.

Quality Management – I will explain how I have applied the company's QMS and the importance and adhering to it. I will explain the result of not having a robust quality management system, my experience of where this is lacking in my job and how I'm striving to improve it.

Engineering and Project Management – Managing the renewal of data license each year enabling my company to make use of the spatial datasets. The legal aspects covering copyrights, database rights and intellectual property rights and how this applies to my job role.
- I'll explain how I use Prince2 Methodology when managing a project. My role as the IT Lead, how I lead an IT workgroup on a regular basis and my role whenever a need is identified.
- I'll discuss how I prepared tender documents to ensure they aligned with the MCHW, advertising the tender and logging tender queries. I'll also cover the legal issues I encountered in relation to insurability of a clause and how I sought legal advice on how to proceed.

Teamwork – I'll explain that a lot of my work as IT Lead is self-driven, how I interact with staff to see how I can help them streamline their systems and how I train members of staff on new systems.
- My role as a Flooding Officer and how I interact as part of a larger team when tackling emergency flooding issues.

Communication – I'll discuss when I engaged with the public during traffic calming consultations and how I produced engineering drawings appropriate for general public understanding and resolved disputes.
- How I provided Contract Drawings for Design schemes with detailed specs of construction and construction methods.
- Examples of when I used the Method of Measurement from the Contract to debate on costed items when bills came in from the Contractor.

Life-long learning – Attaining at least 25 hours per year of CPD. The value I see in constantly developing my knowledge through formal training courses, webinars and self-learning and explain briefly the learning resources we have available in my workplace.