MCIBSE CEng Experience Based Learning Record

The purpose of this form is to demonstrate how the applicant has gained learning within a professional environment. They must show that their knowledge and skills are equivalent to those gained in an academic setting at Masters level. The learning outcomes on this form are from the Engineering Council Accreditation of Higher Education programmes (AHEP 4) model which details the standards that academic courses must cover to be accredited.

To determine if an engineer has gained sufficient experiential learning to be equivalent to Masters Level learning they must describe a variety of problem-solving activities and projects which they have either led or were substantially involved in. These can be the same projects that are referenced in your Engineering Practice Report. When describing these activities or projects you should identify how you are demonstrating your ability to carry out the activities described in the following learning outcomes. Your description should be clear and concise and include how you gained the knowledge and skills required. Use 'I' statements rather than 'we'.

Name: **Membership no:**

AHEP Reference	Learning Outcome	Company and job title	Date	Examples of **technical experience** gained in the workplace Please add detailed examples of technical experience gained in the workplace.	**For Office use only – Assessor Comments**
M1	Is able to draw upon a comprehensive knowledge of natural science and engineering principles in the solution of complex problems which will often be at the forefront of current knowledge.			The following three engineering principles underpin a lot of my technical project work: • The refrigerant cycle • Carbon sequestration • Power factor A brief summary of what these are and how they apply to my work: • The refrigerant cycle – Most new buildings in the UK are now aiming to generate heating/hot water/cooling from heat pumps, as these are more efficient and lower carbon than traditional alternatives (such as boilers).	

				Refrigerants have condensing/boiling points which are much lower than water. This means energy (in the form of latent heat) can be added at very low ambient temperatures (turning the refrigerant from a liquid into a gas). This gas can then be compressed to add further energy (as compressing gases increases their temperature). This means that for a relatively small amount of input energy (mostly electricity to run a compressor) and at unfavourable external conditions (either via the air, water, or in the ground) a reliable supply of low carbon heating/hot water can be produced. Heat pumps are often also reversible as well, meaning the same equipment can generate cooling in the summer months. Additionally, as the electricity grid continues to decarbonise, this technology further reduced carbon emissions. • Carbon sequestration – The amount of carbon in the world is fixed, however the location of this carbon is what determines what impact it has on the climate. The objective is to prevent increases to (and ideally reduce) the proportion which is present in the atmosphere. Natural sinks such as oceans, soils, and biomass are proving insufficient in absorbing the excessive amounts of carbon released to atmosphere as a result of burning fossil fuels. At a project level, minimising additional emissions from new buildings is the most effective approach, however it is proving not possible to eliminate this entirely. Whilst operational emissions associated with new buildings are increasingly low, embodied emissions (resulting from materials and construction activities) are stubbornly high. At an individual project scale, it is usually not possible to sequester this, either through natural means (e.g. planting trees) or through mechanical means (e.g. carbon capture & storage). Instead, offsetting is utilised, which typically relies on the purchase of 'credits' to support projects elsewhere, often in different countries, where more effective means of sequestering carbon can be pursued. This practice can be controversial, with some offsetting programs questionable in their effectiveness. • Power factor – the relationship between usable power and available power, with reactive power being the difference. The closer this factor is to 1, the more efficient the system is. Most building systems run on alternative current (AC) and utilise components which drag this factor down, most commonly through inductive loads which utilise motors (think anything which uses fans, pumps etc). This can be addressed by adding capacitance to circuits. Whilst my role does not include owning responsibility for mechanical design on projects, it is incumbent on me to be aware of such principles, especially as there are	

				items of equipment (such as heat pumps, ventilation systems etc) which I am involved in specifying and which have known effects on power factor. <u>April 2025 Addition</u> The above points demonstrate my knowledge of natural science and engineering principles. This can be applied to solve the following complex problems: • Understanding the refrigerant cycle is essential to understand how heat pumps work, and why they are so pivotal in decarbonising heat. Because I understand this, I was able to lead strategic decision-making on a recent project to optimise the balance of plant on a heat network. The project team were weighing up whether a network should be ran using a 100% ASHP supply. My guidance was that retaining a small contribution from another heat source (electric boilers) could assist network performance by mitigating periods where the heat pumps would be running inefficiently and at peak conditions (i.e. very cold snaps, perhaps only for occurring a few hours each year). In this scenario the ASHPs still provide 95% of the heat to the network across a given year so it is a low carbon network, but they need to be sized to perhaps 1/3rd of the peak load which is a considerable cost saving (both capex and opex-wise). As a qualified CIBSE Heat Networks Consultant I also used my understanding of CP1 to assist in setting performance parameters for the network. This included flow/return operating temperatures (proposed to be 60/30degC), indicative primary and secondary pipe sizes/standards (in accordance with BS EN 253), principles for hydraulic separation, and phasing of plant installations. Requirements linked to hot water storage and legionella cycles needed accounting for so hot water storage timings/temperatures were looked at. A particular design issue that needed working through was the proximity of ASHP installations in relation to neighbouring buildings. The impact of noise, vibration, and cold plume dispersion required working through to understand the optimal siting for the plant. • Offsetting is a critical element of decarbonisation, but it needs using appropriately are where benefits are clearly maximised. I have been discussing with some of my clients about how community energy funds could be set up, where developers offset emissions from some of their new build activities and set up funds to decarbonise e.g. existing building stock. This does not necessarily need to only address carbon. Water neutrality requirements are currently in play for several boroughs in the [redacted] region, which uses a form of water offsetting in new buildings to fit water reduction devises, such as flow	

				restrictors, in existing homes in the region. I have advised clients on how to address this requirement. On this particular example (a high-rise residential project) I also spoke with a greywater recycling company (SDS) to understand the benefit that these systems could bring in reducing consumption of fresh mains water supply. My conclusion was that it was relatively limited (perhaps ~15 l/p/day reduction on average) and that the cost and complexity of installing such a system was prohibitive. Waste water from showers and taps is sent to a series of treatment tanks (instead of direct to sewer), where it undergoes a lengthy process of chemical and/or biological treatment, before being sent back to the apartments as toilet flushing water. The system requires a lot of extra plant (and space), as well as delivery of chemical agents and associated storage tanks. Furthermore, the building is essentially doubling up on all supply and wastewater pipework. • A description of power factor was provided to illustrate my awareness of topics which tend to fall outside the remit of a sustainability consultant. This is becoming increasingly important as the energy industry starts to move away from a model where there are generators, transmitters, and consumers. Instead, to better integrate renewables and make better use of power, the grid now needs to consider entities as being all of these. At a home level, the use of electric car charging, smart appliances (which may include frequency response devices), installed PV panels, and perhaps storage technologies like batteries and smart hot water tanks, means a much more complicated and better integrated energy management system is needed. I am able to effectively navigate clients through this. For instance, advising clients on new products such as the Mixergy hot water tank or the Levelise aggregated battery management system. On a recent project in [redacted], I identified that the existing proposal of PV + battery storage could benefit from an improved management system. The Levelise product (developed by a sister company of PowerOn) controls battery operation to ensure optimal performance is delivered. Whilst other products (e.g. [redacted]) do the same, the Levelise system adds the benefit of aggregated virtual storage so that a homeowner is effectively entered into the balancing/capacity markets. This brings additional income (£158/yr/home I worked out), and in this particular project I worked out it would reduce the payback on overall battery costs by 2 years (with every subsequent year the homeowner making money from this system).	

M2	Is able to identify, process, interpret and apply natural science and engineering principles in the solution of complex problems. Using engineering judgment to work with information that may be uncertain or incomplete to make a well reasoned conclusion.			I have chosen to answer this with reference to how computer models can be used to assist in my role, and how to ensure they are well understood and used effectively. • Computer models are increasingly used to appraise building designs across a wide range of sustainability metrics, including overheating risk, energy demands, and associated carbon emissions. However, models can be limiting, and in some instances actually incorrect. And even if the model itself is robust, it is only ever as good as the inputs given to it by the consultant. Poor inputs = poor outputs. I only use models if I am 100% confident that I know *how* they work, and that I fully understand and can explain to others the results they are giving me. This enables me to focus on the most impactful parts of an energy strategy as I can generally predict how they will behave in a model, prior to any model being ran. A prescient example in high-density new builds is the relationship between space heating and hot water demand. Hot water demand is typically 2-3 times greater than space heating demand in these projects due to the high fabric standards already being pursued and the benefit of efficient massing. Rather than exhaustively test various scenarios focused on making ever-incremental improvements to the fabric strategy, I tend to focus on the bigger-hitting items such as wastewater heat recovery, flow control devices on showers/baths, and services. These are much more impactful in reducing energy demand. It is my detailed understanding of how models behave that makes me so confident in providing guidance without the need to undertake a model. On a high-rise residential project recently, I became aware of a surprising set of embodied carbon results from a OneClick model that had been undertaken by a colleague. Tests had been ran to show the embodied carbon difference between a heat network for the site and individual exhaust air source heat pumps (EAHPs) in flats. The expectation had been that the latter would show better results, on the principle that the omission of an energy centre (complete with centralised heat pumps, thermal stores, boilers, pumps etc) as well as distribution pipework (both underground and within all risers/corridors) would represent a significant reduction in high-carbon materials such as steel. The results, however, showed the EAHPs to be considerably worse. This led me to investigate the data sources used within the Oneclick model and to conclude that the sensitivity of the model to specific product data was much greater in the EAHP example than the heat network. Environmental Product Declarations (EPDs) were being used for the EAHP input, but they are extremely variable between seemingly very similar	

				products. Investigating further, I became more aware of the EPD process and the care that is needed in understanding literature claims and how this is appropriately reflected in models. • When used correctly and responsibly, though, modelling can significantly improve the quality and efficiency of buildings, both in design and once occupied. Simpler modelling techniques used for compliance purposes, such as SAP and SBEM modelling for Part L compliance, allow a degree of standardisation, ensuring different buildings can be compared fairly on a like for like basis and ensuring a minimum level of environmental performance is being achieved. Alternatively, more complex dynamic modelling softwares can greatly assist in e.g. correctly sizing mechanical plant or projecting how a building might behave in e.g. a different (i.e. warmer) climate. Both types of modelling serve a purpose, and assuming this purpose is appreciated, and models are not used behind their intended scope, this will aid the design process. I am increasingly using Passive House Planning Package (PHPP) on my projects (I am a qualified passive house consultant). I find this provides a much 'truer' representation of building performance. I have recently completed a model for a 600+ apartment building, including the representation of a detailed building services strategy and fabric design. This has allowed me to adapt my technical advice on projects as PHPP demonstrates the benefit of building form (i.e. massing) on energy performance. I can use my understanding of form factor (ratio between building floor area and external surface area) to drive thinking on projects at a very early stage (RIBA stage 0-1) and to drive positive fundamental change. This includes how to orient a building, ideal window sizing, and to avoid unnecessary detailing which is to the detriment of energy efficiency. • The reason for raising this point in response to this question is that it is my responsibility, as an experienced technical consultant, to understand the appropriate remit for models, and to exercise my judgement on when they should (and when they should not) be used. In my role of head of service development within the company, I aim to set a standard for others to follow in this regard. It can be too easy to rely on modelled outputs to direct design decisions, however caution should always be applied and care to understand the modelling parameters should always be taken. An example that comes to mind would be using designbuilder software for overheating mitigation and	

				ramping up the air supply rates from the ventilation system to such an extent that overheating risk was removed. However, in doing so the designer may have created a new problem (internal noise due to high airflow volumes), plus it may prove very challenging to even source a product which could deliver this output. I also became aware of an EAHP product which was being modelled by a large number of consultancies in such a way that I suspected was overestimating cooling capability. The unit works by delivering a theoretical maximum capacity of cooling into the supply airflow (into flats), like cooling can be delivered (a.k.a. peak lopping) from some MVHR systems. If operated purely like this, then the cooling capacity is a function of the cooling coil capacity and supply airflow rates. However, in investigating how this EAHP product worked and discussing with the manufacturer/consulting schematics I realised that a significant limitation existed. Waste heat is not exhausted into the extract airflow like MVHR peak lopping systems. Instead, it is sent to the hot water cylinder. In one sense this is very sustainable as it is providing the occupant with free hot water. However, it also means that the cooling will cut out once the maximum store temperature of the cylinder is reached and it can only be restarted if a large volume of hot water is then used to lower the tank temperature. Given Part O CIBSE TM59 models are most sensitive to nighttime temperatures in bedrooms (this is where cooling is needed most due to closed windows in noisy locations), there is no expectation that hot water will be used in large volumes during sleeping hours. Thus, there is a very real limitation of the cooling supply of the unit. The company is working on how to more appropriately model this feature given its relationship to hot water demand. <u>April 2025 Addition</u> Additional content has been added to the first two bullet points, to provide more detail on how modelling assists (but, crucially, does not dictate) my decision-making. An example was already provided on the 3rd point.	
M3	Is able to engage appropriate computational and analytical techniques to better understand complex problems			As per my response to M2, computer models are increasingly used in the built environment to appraise sustainability criteria and, hopefully, deliver overall better buildings. There is also a growing appetite for the collation and review of in-use data for buildings, such as meter readings, temperature sensors, and thermographic surveys. In compiling and analysing large packages of data, some of which can contain sensitive	

				information and invoke GDPR responsibilities, I must use appropriate analytical techniques. A few examples include: • Ensuring a complete set of 12-month meter readings are used to calculate efficiencies of district heating networks. Often incomplete data is provided, but extrapolating from data for only several months across a year would not properly reflect the impact of seasonal changes which significantly change the heating demands and patterns on networks. Additionally, where data is provided, erroneous meter readings are common. I need to be able to efficiently and effectively review meter readings so I can quickly pick up anomalies and interrogate them. Whilst not ideal, on several projects I have undertaken reconciliations of metering data and reactive costs to calculate backbilling charges for heating tariffs. In line with Heat Trust guidance, backbilling should not be for periods in excess of 12 months previously. The review of data in one instance highlighted a very high electrical consumption associated with pumping energy costs for an ambient loop heating/cooling system. An allowance had been made in the year 1 tariff on the basis of conventional heat network pumping energy consumption, however upon review this far too low. The additional electricity required to pump water around the high-rise building this system was for was enormous, adding £750/yr/dwelling to bills alone. It was clear the system had been conceived, designed, installed, and operated very poorly and building occupants were paying the cost. This experience has informed my critical analysis of ambient heating/cooling network systems on all projects since. • Reviewing the complex projections for decarbonisation of the UK electricity grid. There are many scenarios for which differing projections exist. This is an example of how understanding the variables is needed to review data-driven projections, to allow me to select the most appropriate scenario for the work I am doing. I review the Future Energy Scenarios produced by NESO and utilise the DESNEZ Green Book greenhouse gas projections in my work. In one project I also looked at the importance of marginal carbon emissions. Rather than only focusing on annual averages for grid-based emissions (which is what sources like SAP use), marginal emissions focuses on the impact of *when* energy is used within a defined period (e.g. a day, or a season, or even an hour). Alignment with this can also be applied to things like time of use energy tariffs. There are similarities between when energy is at its most expensive and also at its most carbon intensive. On this project I looked at the optimal time to run a CHP engine to maximise both income from electricity generation and mitigate grid	

				carbon emissions (which are highest in peak demand periods, such as weekday early mornings or evenings). It became clear that the most economical approach was always to maximise use of electricity generation within the building and that aligning this to high usage periods was most beneficial • Understanding the difference between quantitative data – for instance meter readings – and qualitative data – for instance responses to questionnaires. The latter is subjective, and its reliability should be carefully considered. Nonetheless, as it is people ultimately who use and live in these buildings, this information may perhaps be more important than quantitative measures. Overheating considerations are a prescient example of this. If assessing overheating purely within the realms of CIBSE TM59 limits, it would be completely acceptable to allow nighttime temperatures in bedrooms to be up to 25.9degC for months at a time (an exceedance of 32 hours over this is also permitted). However, from feedback on occupied developments I have worked on, overheating complaints are one of the most common in new buildings (even when TM59 modelling has identified no undue risk).	
M4	Is able to select and critically evaluate technical literature and other sources of information to solve complex problems			My role requires a detailed understanding and application of many technical literature sources, and to advise clients and other consultants of how they can be practically implemented on live projects. Often, a complete understanding can only be gained by reviewing and understanding a suite of interconnected documents. One example relates to providing advice on how buildings can comply with the energy efficiency requirements of the Building Regulations. This requires a detailed understanding of all three of the following documents: • Approved Document L (2021): The Building Regulations 2010 • SAP 10.2: The Government's Standard Assessment Procedure for Energy Rating of Dwellings • SAP Conventions (version 10.0) The Approved Document L sets out the actual regulations and provides guidance on how the regulations are viewed to have been achieved. Some of the regulations require adherence to a calculation methodology (known as SAP 10.2) to demonstrate that buildings are sufficiently energy efficient and have given due regard to associated carbon emissions. The calculations are done in approved SAP software subject to energy modelling and inputs from the qualified SAP assessor. I believe that the best consultancy on this topic can only be provided if the assessor really understands the calculation methodology that underpins this software, and can assist in interpreting	

				the numerous nuances that occur when using the software. This therefore requires a thorough understanding of the SAP 10.2 and SAP Conventions document. A detailed appreciation of all of these elements is even more important now as a result of the introduction of the Building Safety Act, and the greater responsibility now placed on the design team consultants to ensure buildings are compliant with all elements of the Building Regulations. I have been upskilling myself in these requirements recently to ensure I understand my role and responsibilities in relation to this. <u>April 2025 Addition</u> Examples of how I evaluate conflicting or complex information to make informed decisions: • The elements of the Approved Document for Part L which apply to refurbishment projects are challenging to navigate. Unlike for new builds, standards are not uniform and a number of relaxations and/or exemption can be applicable if the project is subject to certain constraints. For instance, limiting U-values for new or renovated external walls can be relaxed if the building is listed, or if adding wall insulation reduces the internal floor area of rooms by more than 5%. On a project in [redacted] I advised a client that whilst acceptable in Part L terms, the connotations of not refurbishing a building to these standards need considering, such as condensation risk and higher energy bills. My team then undertook condensation analysis and investigated both interstitial risk (i.e. within build-ups) and surface risk (i.e. on surfaces). These models are sensitive to the appropriate selection of boundary conditions in relation to calculated dew point temperatures. In other projects where condensation analysis has been required to discharge building warranty conditions, I have found that careful scoping of the modelling parameters in agreement with the provider (e.g. NHBC), to agree e.g. set outdoor/indoor temperatures, will expediate the sign-off process. Furthermore, I engaged with manufacturers to assist in securing the inputs for my team's models. • I also appreciate how focusing only on embodied or only on operational carbon can fail to see what matters most, which is lifecycle carbon. I was informed on a project by a structural engineer that embodied carbon from structures can be reduced if more building load can be transferred from floor slabs and onto columns/piles. The total concrete used in this scenario is less than where fewer columns are used but floor slabs are thicker (less concrete = less carbon). However, I was able to point out to this engineer that increasing the number of	

				columns in the external wall profile would likely depress U-values, and thus increase operational carbon. What matters most is total emitted carbon, so reducing embodied carbon to only increase operational carbon was not necessarily doing this. I then undertook a study to quantify this using both SAP and Oneclick software outputs, and concluded that whilst operational carbon did increase as a result of poorer wall U-values, a much greater amount of carbon was saved by reducing the concrete volume in the structure. However, as with all lifecycle carbon conclusions, time is an important component. If you assume a building lasts 60 years (the RICS backstop for building lifecycle calculations) then the impact of operational carbon will be much lower than if you assume the building lasted for say 100 years. Embodied carbon is largely spent at the point of building construction (with some follow-ups related to replacement/maintenance activities), however operational carbon is ongoing for the lifespan of the building. Thus, when faced with judgements on what is best, decisions on building lifecycles could have returned a different conclusion (i.e. worsening U-values = more carbon vs structural efficiencies in this scenario). • If you were to follow the applied policies and supporting guidance provided by the [redacted] for referable planning applications, then you would always propose a heat network as part of a site energy strategy. However, I am able to use my extensive experience of heat network commercials to provide more tailored advice, which typically includes advising against this strategy for smaller sites where no external connection to an existing area heat network is likely. This is on the basis that customer bills can become very high for small heat networks. As a [redacted] Consultant I understand the application of CP1 on heat network projects and the benefit of economies of scale when it comes to operating networks. A longstanding frustration with heat networks is the siloed nature of most existing networks. Most are constructed on the basis of planning obligations by private housebuilders on development sites. However, few expand their system beyond their site boundary due to commercial reticence. Thus, there are hundreds of small (and inefficient) heat networks, especially within [redacted]. On one project a feasible opportunity for a site arose to connect the heat network to an existing waste heat system in the local [redacted] borough. My client did not want to connect, but the local borough was very keen. Both parties were undertaking decision-making on the basis of what they wanted to happen, rather than following an evidence-based approach. I convinced both	

				that a feasibility study, appraising key metrics such as connection charges, tariffs, carbon emissions, service levels, and contract protections should be undertaken. Only once complete could the best decision be made. It arose that in this particular case, contract KPIs such as end of contract heat provision and termination rights were not reasonable from the external heat network operator. Thus, I advised my client ultimately to not connect.	
M5	Is able to resolve complex problems using original thought meeting 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.			Whilst I firmly believe that a good technical consultant is one who utilises experiences from previous projects, and does not just rely upon guidance documents, it is also important to ensure that each new project is looked at with fresh and unburdened thinking. What worked on one project may not be appropriate for another – it is imperative that I am adaptable and that I always take the time to study the specifics of new projects when first working on them. Examples of how projects I am working on have benefitted from ideas which are not always commonplace include: • Onboarding employees in the local borough for construction teams, ensuring new buildings invest in jobs for the local economy • Driving new learning by proactively meeting with manufacturers of new products to discuss how they work • A proper evaluation of the merit of refurbishing existing buildings, rather than knocking them down and building something new (which is often the easier approach). This focuses on the merits of avoided embodied carbon (inherent in demolition and new builds), and circular economy principles (deconstructing rather than demolishing buildings, to maximise reusability of products/materials). I have found from undertaking several studies that in most projects high-rise residential projects, it is not possible to retain and renovate existing structures. The existing buildings are typically not structurally adaptable for their new intended use (i.e. a factory space being repurposed as a high-rise apartment block). However, there is value in auditing the existing building and creating an inventory of existing materials. This assists with reusing items or identifying appropriate recycling options if not possible. Over time, I have built up a considerable mental library of technical literature, meaning I do not always need to revert to large source texts when advising clients on codes of practice or industry standards. Nevertheless, I routinely check the advice I provide remains up to date and has not been superseded.	

				<u>April 2025 Addition</u> Further examples of original solutions/thinking: • As a [redacted] consultant, I am very familiar with [redacted], the assessment tool used. It is a much more comprehensive and dynamic quantifier of energy usage for a building then other more widely used tools. I have extracted specific calculators from this tool and applied them to other company services. For instance, I have adapted an appliances calculator which can quantify annual demand associated with plug-in devices such as white goods and entertainment systems, for use in our planning application service. PHPP is a complex platform which most people in the company are unable to use, however by extracting some components of it for more bespoke usages I have improved the quality of another service and enabled other staff members to learn how to interact with a specific part of the software. There is also a large amount of supporting literature and software packages which I have familiarised myself with and are increasingly using on passive house projects I am working on. This includes software plug-ins which can calculate poorly understood energy demands in buildings, such as lifts, pumps, and corridor heating/cooling inputs. On one project I also needed to instruct the client that if only designing to a passive house standard then omissions linked to Building Regulations compliance could occur. It was the client's (understandable) assumption that a passive house building would be superior to a building solely focusing on Part L & O compliance. Whilst broadly true, I advised that in some instances (ventilation supply/extract rates and CIBSE TM59) current Building Regulations are actually more onerous that passive house compliance metrics. This required careful liaison with wider design team members, as well as the [redacted]. • As a technical consultant I am very mindful of not becoming siloed in my thinking. An appreciation of how my work interacts with other disciplines delivers a better project (and a better building, ultimately). I am promoting this way of thinking in the company at the moment, by trialling a new method of reviewing technical work. To date, senior technical consultants in a particular discipline review the work of less experienced staff in the same discipline. Whilst technically astute, this potentially misses out on the valuable input of another consultant from a different perspective. I have been trialling a 2nd reviewer on certain pieces of work, intentionally someone not as familiar with the service in question but very aware of other services. For instance, I asked a senior colleague from the overheating service to review one of my energy	

				reports. And I was asked to review a BREEAM assessment, which is not a service I undertake, but felt I was able to add some technical energy-focused input. In both instances, the quality of the work was strengthened. I aim to expand this to the whole company. This is increasingly important in relation to building safety (and the Building Safety Act) which is formulated on the basis of coordinated design, to minimise siloed thinking by design team members and contractors. I am familiar with the [redacted] approvals process and the current difficulties that some projects are facing in navigating this process. I have authored detailed sections in Part L compliance statements to the Building Safety Regulator. I have a detailed understanding of the contents of Approved Document Part L and relevant codes of practice/industry standards. • I have been discussing with NIBE, a leading heat pump manufacturer, about how I could perform a technical appraisal of their new S735C product. Working directly for a product manufacturer is very unusual for the company I work for (most of the client base is a development company or housebuilder) so this demonstrates my ability to bring in to play new types of clients. This piece of work is now underway, and I have led the detailed scoping exercise to evaluate performance parameters for the product. Specifically, I am examining how the cooling element works and what means of delivering this cooling is most effective (e.g. fan coil units, cooling radiators, or underfloor cooling beams). As part of this study, I will also consider costs of these various solutions, both to the housing developer but also to the residents (in the form of maintenance & electricity consumption bills). I suspect fan coil units will deliver cooling most effectively, however I know from other projects that these come with significant operational costs, which more passive emitters such as underfloor or radiators do not. Commercial, environmental, and safety elements are covered in this work, requiring coordination with a number of companies.	
M6	Is able to approach, plan and resolve complex problems using a systems approach and taking account of multiple stakeholders and/or factors.			Problem solving is at the core of technical consultancy. The process for tackling this needs to consist of: • Identify and define the problem • Understand the objective – what does a project want to achieve • Outline options for how to address the problem • Appraise the suitability of options and recommend the most appropriate solution Examples of recent problems on projects I am working on where this approach was used include:	

				• Determining the most appropriate heating strategy for a large masterplan of 1,300 homes • Providing alternative means of complying with Part L requirements for a building where insufficient space had been allowed for to install soffit insulation. The limiting Part L U-value for this build-up was 0.25 W/m²K so a hybrid solution which relied on installing mineral wool insulation in sporadic locations (where possible) and careful management of the space was agreed. The management element is very important, with the floor beneath the apartments being used as a commercial space. The prospective occupants were to use it as an office, so the space was expected to be heated to a similar temperature as the apartments above during weekday working hours. However, requirements were also added to the lease for the heating to remain on during evenings and weekends as well so as to avoid significant heat loss (and potential condensation build-up) through the floor of the apartments. Furthermore, the client needed to understand the impact that repurposing the space in future could have, to avoid periods where no heating was on. Overall, this issue is a consequence of poor design team planning and shows the unintended consequences of missing insulation (i.e. heating unoccupied spaces to meet Part L obligations). • Advising an architect on what the most effective use of roofspace could be in relation to the siting of air source heat pumps and photovoltaic panels. The performance of both technologies is affected by the local environment. PV panel output drops drastically when overshading occurs. This is also affected by the design of the PV array and how panels are linked together (e.g. in parallel or in series circuits). Some panels were shut off completely even if only a small area is shaded. Heat pumps, too, need siting so they have access to a good supply of 'fresh' air, and so exhausted air does not interfere with the fans bringing in new air. Heat pumps for heat networks are also quite large, and usually require acoustic enclosures which further increases height/width if the installations. This then also brings a shading issue if located too close to PV panels. I appraised all of these factors as part of my rooftop analysis on this project. Taking a closer look at the first example, I first had to determine by what metrics/measures the most appropriate heating strategy would be appraised against. This scoping exercise set out the following key measures: operational cost (i.e. what customers would pay via energy bills); capital cost; carbon emissions (both presently	

				and into the future); impact on overheating risk; planning risk, and regulatory compliance. This therefore addressed multiple factors and a variety of stakeholders. My work concluded in a report and presentation to the client showing the performance of different heating strategies against each of these measures, with a conversation then following about which we collectively thought to be the best option.	
M7	Is able to evaluate the environmental and societal impact of solutions to complex problems			Some of the decisions made on projects of mine come with a cost vs carbon conundrum. In other words, choice 1 might reduce emissions the most but saddle end-users with higher bills, and choice 2 might reduce emissions much less but keep bills down. Navigating this is challenging, especially as higher carbon solutions also come with 'other' costs – not just to present peoples, but also through damage to the environment which needs addressing by future populations as well. This fits in the wider dilemma of who should shoulder the burden of mitigating and adapting to climate change – is it fair to bill present day people for the emissions generated by past generations, and so on? This dilemma also straddles county/continental differences as well, with many of the countries most affected by climate change least responsible for it. <u>April 2025 Addition</u> Examples of how environmental considerations have been integrated into my projects (note as a sustainability consultant, my job is essentially geared towards this on all projects): • Providing guidance to an architect on thermal improvements that could be made to refurbishment project. This included the adoption of insulated plasterboard to the existing brick structure, ensuring adequate ventilation is retained in the building to mitigate any condensation risk, as well as the installation of mineral wool batts to the underside of existing roof timbers; • Advising a housing association on how best to integrate PV panels and battery storage. Installing these technologies is not enough on its own, with the battery needing to be sized and operated to maximise the benefit of solar PV generation. This is to ensure the maximum amount of PV generation can be used in the building, with this presenting both a lower carbon and a higher cost saving alternative to selling electricity to the grid. The smart export guarantee (SEG) rates are generally poor (perhaps 6p/kWh) compared to the value saved by using in the building and not purchasing electricity direct from the grid (e.g. current rates around 25p/kWh). Furthermore, marginal carbon emissions (i.e. dynamic variability throughout a given day) tend to show the electricity grid being its most carbon-intensive during peak periods, so use of stored PV	

				generation from the battery, if aggregated across a large number of homes, noticeably reduces the carbon content of grid electricity in these periods.	
M8	Is able to analyse a proposed course of action on the basis of ethical choices and relevant professional codes of conduct.			I'm aware of the Statement of Ethical Principles published by the Engineering Council, which notes honesty & integrity, respect for life, law, the environment & public good, accuracy & rigour, and leadership & communication, as it's four leading principles. These are at the front of all the consultancy I provide. Most of the clients I work for understand and appreciate this, and act in good faith themselves. Occasionally there can be exceptions – one example is where I was pushed to declare to a planning authority that a piece of equipment had been installed and was operational when it had not been. I refused to do so, even though it involved several uncomfortable meetings and phone calls with an unhappy client. <u>April 2025 Addition</u> Additional information provided on the above example of an ethical dilemma I experienced: • The equipment in question was a combined heat and power engine (CHP), intended to be used on a heat network • The client wanted to go back to the planning authority to get a new planning consent so they could build more homes. In doing so, they would have triggered the new carbon policy requirements applied at the time, which would have pushed them to change their heating strategy from a CHP to air source heat pumps • They didn't want to do this, so instead wanted to try and convince the planning authority (via me) that as the CHP was about to be installed it was too late to change to heat pumps. This was not true as they had not even procured the CHP engine at this stage • I refused to do this, as it was breaching my role as an objective technical consultant • Instead, we worked through a compromise solution where heat pumps were added to the network, but in a way which did not frontload the cost to the project. A staged installation of plant was proposed, which was more appealing to the client and still in accordance with the low carbon policies applied.	

M9	Is able to employ risk management techniques in the management of activities and projects			As a technical consultant in built environment, the projects I work on are governed by Construction Design & Management Regulations (CDM). As part of this I have a role in highlighting risks related to the specific consultancy I provide. For instance, identifying a risk of falling from height related to the installation of PV panels on roofs, and working with other consultants (e.g. architect) to mitigate this risk through design measures, such as the provision of sufficiently high roof parapets and mansafe systems. <u>April 2025 Addition</u> Additional risk management examples in my role include: • Condensation risk analysis. This could be interstitial and/or surface condensation risk analysis. I am required to evaluate the thermal performance of building components, such as window systems and wall build-ups. This is to prevent condensation build-up in homes, which is a known health risk when occupants are subjected to lengthy exposure • Overheating risk in new homes. This is an increasing risk due to the warming climate, and is worsened by the propensity for housebuilders to select sites close to sources which constrain natural ventilation opportunities. Most common this is due to traffic noise, meaning occupants cannot open their windows for prolonged periods. I lead many projects where we undertake this analysis and mitigate this risk by providing both passive, and where necessary, mechanical solutions to this issue	
M10	Is able to identify security risks in any proposed activity and mitigate them as appropriate			As I handle sensitive client information on many of our projects (and am sometimes required to sign NDAs), I am careful in what information I present in meetings and in deliverables, especially if for pubic consumption (like a planning application report). I also recently received a very convincing phishing request over email, written just like a client would and from a seemingly legitimate email address. Clicking on links or responding could have provided access to our IT systems. Fortunately, as I have had cyber-security training I was able to recognise that it was not legitimate. <u>April 2025 Addition</u> The company utilises a professional IT support company, who I liaise with regularly to ensure firewalls, antivirus protections, and other protection softwares are installed, updated, and 100% operational on my computer. I also read and listen to articles, videos, and presentations suggesting tips on how to remain vigilant to electronic threats. I make myself aware of commercial protections that the company has, such as	

				cybersecurity insurance. Multifactor authentication is also used for many of my work applications. I also need to be aware of intellectual property theft, and the risk that outputs I produce or contribute to could be copied and used without my knowledge or consent. This risk is enhanced where my work is made publicly available, such as in reports for planning applications or in the production of articles for the company website. In reality it is very difficult to prevent this from happening – technical consultancy is as much about understanding and making sense of existing ideas as it is creating new ones. Nonetheless, ensuring correct support is available in the rare occurrence you may require it, such as with insurances and access to solicitors, assists.	
M11	Is able to use the principles of equality, diversity and inclusion for the benefit of all stakeholders			Social Value is a topic of increasing importance in the built environment. New build developments have in the past appeared exclusive, particularly to those who cannot afford to live in such places. As head of service development at [redacted], I am keen to upskill our staff so that we can drive Social Value more in designs. I have been applying principles myself on a recent project, particularly in relation to how new development can provide spaces, such as community centres and play areas, which actively involve residents in existing areas as well as the new buildings. <u>April 2025 Addition</u> User-friendliness of new technologies is also an area I focus on. I would refer to myself as an innovator rather than an inventor. Development of new technology is not my focus area, but review of new technology and a keen understanding of its advantages and disadvantages on behalf of stakeholders, such as clients and the public is my area of focus. For instance, I have developed a large database of information on the operation and servicing requirements of renewable technologies. This includes newer products such as solar PVT panels, which combine the benefits of both solar thermal and solar PV technology. Another example is a comprehensive database of annual maintenance regimes for heat interface units, MVHR systems, and heat network heat pumps. Understanding the complexity of these, who can undertake the servicing, and how much it costs, is crucial to advising on the practicality of new technologies.	

M12	Is able to assess the practical factors underpinning any technical solution			As I work in a technical consultancy role, it can become easy to get preoccupied by exciting technological advances. However, at the centre of good consultancy is an appreciation of the practical reality of living with a technology. A key part of this is how expensive a technology is to run, as in my role this directly translates to energy bills. I recently undertook a review of leading exhaust air heat pumps (EAHPs) products on the market, and it became clear that there was a wide variation in product support and running costs between models. I advised that a much earlier commitment to specifying a specific product than usual was needed, to avoid unintended consequences for end-users.	
M13	Is able to select appropriate materials, equipment and technologies for a given project or activity.			On several projects recently, I have been asked by clients to advise on how Energy Performance Certificate (EPC) ratings could be improved for some of their housing. They had previously received advise from another consultant that the best way of doing this was to make intrusive (and costly) upgrades to all thermal elements, i.e. walls, glazing, roofs etc. By understanding the methodology behind how EPCs ratings are devised, however, I was able to offer a much more straightforward and cost-effective means of uplifting ratings. By focusing on measures which reduce reliance on grid electricity, much greater improvements in ratings can be achieved. In other words, the addition of a few PV panels and a plan to ensure the majority of generated power was used in the homes (rather than exported) would boost the EPC ratings very effectively.	
M14	Is able to employ quality assurance principles in delivering stakeholder satisfaction			As a technical consultant, my client-base is largely repeat business. I've worked hard to develop strong relationships, both within and outside of the company. This is based on trust that I will undertake work professionally, and deliver outputs which are consistent, helpful, and reliable. Part of this process means I regularly have my work reviewed by others in the company to ensure it is of sufficient quality and aligns with the company's standards. I also review others' work. Regardless of how confident or competent I am, I always value the input of others on my work as they may be able to suggest additional content/methods which I hadn't thought about.	
M15	Is able to manage a project efficiently against key deliverables			I currently manage ~40 projects internally, the largest of which are worth over £100,000. I have successfully closed out hundreds of previous projects of varying scope/value, coordinating deliverables and liaising with clients and other consultants to ensure work is delivered on time and of an excellent quality. <u>April 2025 Addition</u> As a senior consultant in my company, I spend a lot of time training and mentoring less experienced staff. Initially this is done alongside projects, to ensure a safe space to learn is provided, but not completely detached from project operations to ensure new	

				staff experience and understand aspects of project management such as client relationships, workload planning, and deadline management. I firmly believe good consultancy is as much about how you communicate as it is about what you know. Making less experienced staff aware of how they present themselves in meetings as well as their writing capabilities is a core development skill. As head of service development in the company, it is my role to highlight technical developments in service areas to staff and to assist them in identifying improvement plans for the services they work on day to day. For example, [redacted] are increasingly being released for products. This provides a verifiable carbon footprint for the manufacture of products. I have been working with one of the service leads for the embodied carbon service in the company, regularly reviewing new EPDs which are released with them and determining how this affects the service they lead. This is particularly prescient for exhaust air heat pumps, which are a type of product favoured by many of our clients currently. Newly released EPDs are showing significant embodied carbon variability between manufacturers when seemingly very similar products are compared.	
M16	Is able to function effectively as an individual, and as a member or leader of a team. Evaluate the effectiveness of own and team performance			My rather unorthodox route into my career (originally a history graduate) meant I started with strong skills in relation self-discipline, organisation, and the ability to read/write critically. My ability to work well within teams was something I needed to practise in my first couple of years and develop. As a member of the [redacted] team and the head of service development my role now is much more about identifying opportunities for the business, devising action plans, and then delegating tasks. As part of this I evaluate and develop less experienced members of the team.	
M17	Is able to communicate effectively on complex engineering matters with technical and non-technical audiences, evaluating the effectiveness of the methods used.			I've recently completed a detailed study of exhaust air heat pumps (EAHPs) on behalf of a client which is considering using them in new developments. The summary report I wrote is technical with a lot of detail, but this detail is concisely explained with clear decisions/actions signposted. Lengthy prose is not effective in communicating need-to-know information. I also presented key conclusions from this work to the client team in a meeting, with the audience composed of very technical people and very commercially-minded people, which required an appropriate summary which did not alienate either audience. Key point here – I need to be adaptable and shape my consultancy in line with the audience.	

M18	Plans and records self-learning and development as the foundation for lifelong learning/CPD.			I have nearly completed a MSc in Building Services Engineering which I have been studying part-time alongside my employment. Learnings and notes taken from this have been used in my day-to-day job to improve the quality of my consultancy, and I have shared notes with colleagues so others can benefit. <u>April 2025 Addition</u> I regularly write publicly available articles for the company website on a variety of environmental topics, and in 2020 authored a technical document which was used to inform decision-making by the [redacted] authority on enhanced air quality standards in the borough for new development. This demonstrates that I aim to share my knowledge and capabilities beyond the confines of the company I work in. Away from my employment, I have contributed to community efforts on environmental issues. For instance, I spent a month in 2013 living on and contributing to an off-grid project in [redacted] and learning basic construction skills.	