FELLOW UPGRADE EXEMPLAR

Institution of MECHANICAL ENGINEERS

Section 2: Your career history

Part A: Description of current role and organisation

Please provide a description of your current role, the organisation and its objectives.

Company X, Bristol
September 2016 to present
Current Role: Chief Engineer

Areas of responsibility:
- Engineering Policy
- All aspects of Mechanical Engineering on all company projects, including the management of service and repair depots
- Staff training plan
- Liaison with industry and academia stakeholders
- Ensuring compliance with national and industry standards relevant to the water industry

Company X supplies drinking water to more than X million households and treats wastewater (sewage) from nearly X million households across County A, County B, County C and County D.

Recent achievements:
- Established a 'new product think tank' which takes staff from all areas of the company to proactively brainstorm new opportunities
- Increased overall profitability of engineering division by 15%, by adopting innovative working practices
- I am leading our company's efforts to achieve institution accreditation for our graduate training schemes

Company X is water company responsible for circa 200,000 items of plant distributed across thousands of sites. The plant ranges from simple equipment such as: small pumps, valves, compressors, etc to large complex process equipment such as: pumps in excess of 750kW, screens, combined heat power units, odour control systems, centrifuges, chemical installations and sludge dryers. The plant is often installed in hazardous and challenging environments.

The business has a turnover in excess of £XXX million a year, to which a significant proportion of expenditure is the installation and refurbishment of mechanical plant. The business has circa 1,500 direct employees and is broadly divided into the following functions: Operations that operate the infrastructure, Assets that provide the engineering support to the business, Capital Delivery that manage the installation of equipment and Support Services that provide services such as customer services, HR, finance, etc.

Our business is supported by a sub-contractor base, largely under my direction, typically totalling a further 1000 heads.

Part B: Your career history

Include a brief summary of your career history; give a brief description of each role held since election as MIMechE and the dates the positions were held

2019–present: Chief Engineer
Head of mechanical engineering for Company X, with responsibility for providing the lead on all strategic mechanical engineering issues, policies and strategies.

2018–2019: Special Projects Manager
Reporting immediately to the Asset Director with the responsibility for delivering key projects, examples of which were: project managing the engineering function within a £X billion business plan (PR09), management of £5million contract and a feasibility study for a £63 million sewerage scheme.

2016–2018: Strategy Manager
Management of an engineering team responsible for delivering maintenance strategies and solutions for the company's 210,000 mechanical, electrical and civil assets.

Company Y
September 1989 to September 2016

2015–2016: Principal Engineer
Formulation of engineering policies, procedures, best practices and preparation of multimillion pound framework supplier agreements for key water industry equipment.

The following roles were held prior to my election as CEng MIMechE:

2013–2015: Mechanical Engineer
2009–2013: Liaison Engineer
2003–2009: Mechanical & Electrical Technician
1989–1993: Multi-skilled Apprentice

Qualifications:
Chartered Mechanical Engineer achieved following Career Learning Assessment (CLA)
BEng 2.1 Honours Degree in Mechanical Engineering Certificate in Management

Section 3: Your organisation chart

We need to see an organisation chart of your current employment which clearly shows your position within the organisation, any direct reports that you have, specifically mentioning if any of your direct reports are registered engineers. You should put a ring around your position to highlight it. Please ensure that it is A4 and legible in black and white.

The purpose of the organisation chart is to help us understand the size and type of organisation for which you work, and where your own personal accountability lies. This will give us a sense of the likely responsibility and authority your role conveys and will help us frame questions for your interview.

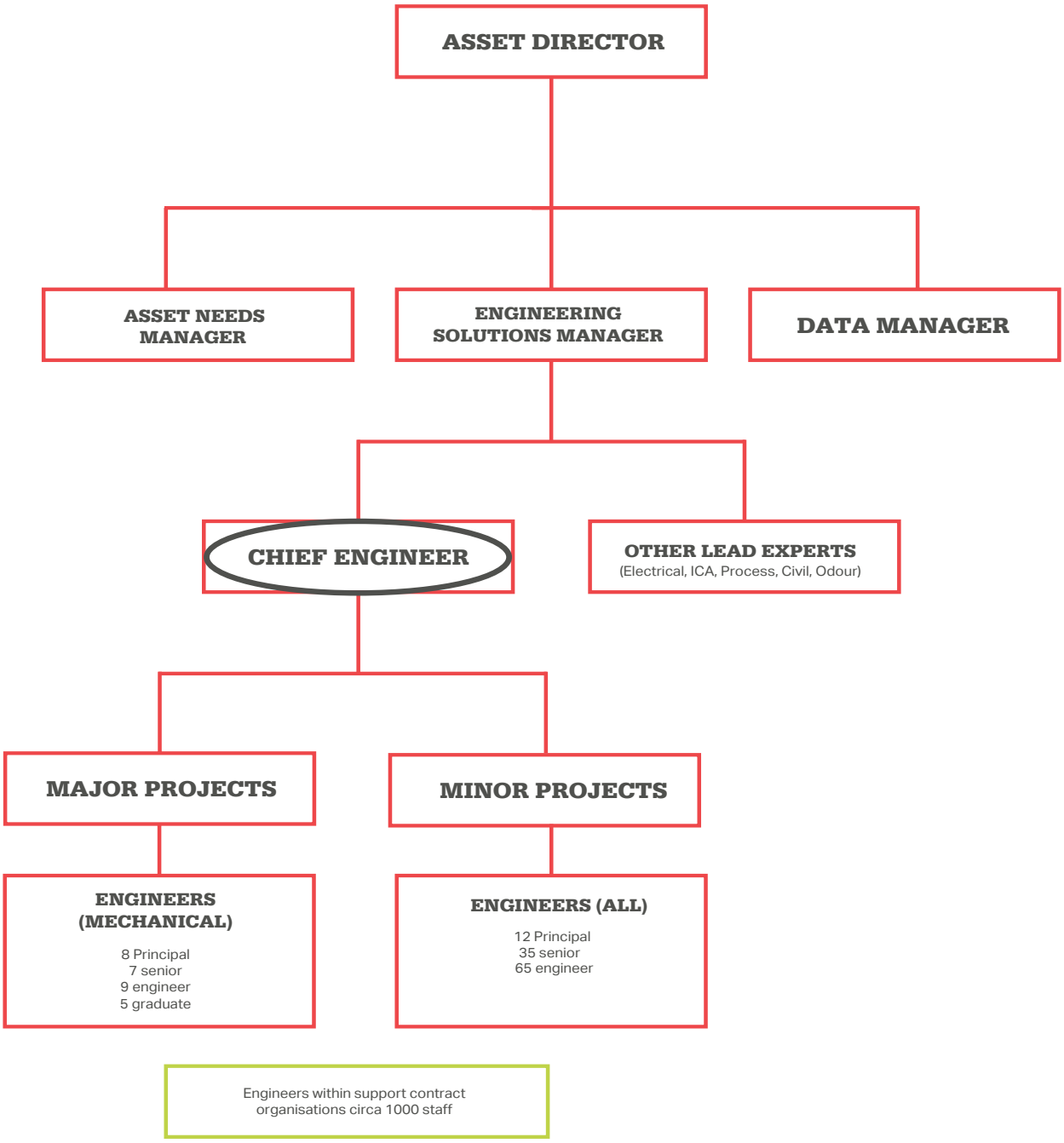
If you are not part of an organisation, please fill out the fields below.

For applicants who are not part of an organisation

Please describe your direct clients.

Please describe who you report to (e.g. Board, CEO, MD, Head of Engineering).

Organisation chart



Section 4: Evidence of Fellowship requirements

Provide strong examples and objective evidence to demonstrate how you have met the qualities for Fellowship.

Please limit your answer to 400 words for each section that you complete.

- ALL Essential qualities
- ONE Desirable quality, plus
- At least ONE OTHER, which could be in the Desirable or Optional categories.

Essential qualities

E1: A position of senior responsibility and/or significant autonomy in your particular field

As Chief Engineer I hold Board-level responsibility for the direction, output and assurance of engineering teams based across the company's operating region covering design of new facilities, systems upgrades, major refurbishments and introduction of new technology or innovations from the 'new product think tank' that I set up. My teams of about 75 direct staff and 75 contractors are principally experienced Chartered Engineers or specialist technical staff.

I am responsible for engineering work on the company's 5 year project plan, approved by the regulator with a typical annual spend of £X00m. The direct costs of my department, are £X0m, of which about 75% are allocated to projects; however, my team are also responsible for a similar volume of engineering design work carried out by consultants and contractors.

My teams are responsible for the development of long term asset management strategy, key engineering decisions on major projects and adoption of technical standards as well as approval of any deviations proposed by contractors that may be require by special circumstances. This includes adoption of new technology including recently autonomous mole directional drilling under properties and new carbon fibre composite pipes for weight critical high pressure applications.

E2: Demonstrable leadership qualities

In my previous role Strategy Manager I led the adoption of new maintenance strategy moving away from time based and reactive maintenance, to adoption of risk based inspection and extensive use of advanced condition monitoring. I had to obtain approval from the board for investment of over £25m in training, new equipment and a central control room. After initially difficult negotiations with unions that I led, we obtained staff support for extensive retraining of over 300 field technical staff. The project delivered a 20% reduction in costs and 35% reduction in notifiable service interruption incidents, as well as reduced engineering field staff turn-over.

In my current role I am leading adoption of a new water industry control, monitoring, diagnosis and protection standard for pumps to obtain reduced engineering and procurement costs for equipment that enables a modern asset management approach for remote equipment. Following two years working closely with other chief engineers from other utilities and key suppliers including pump, motor and control equipment suppliers, my BS ISO committee has issued a first draft for detailed comments.

Essential qualities (continued)

E3: Influencing policy and strategy making decisions in either a technical or business environment

As Chief Engineer in Company X, I am responsible, via the Engineering Solutions Manager, for engineering and technical input to company strategy. I 'own' the Company's Short-Term Strategy Plan (out to 5 years) and develop the Medium-Term Plan, out to 10 years, as a Board-level Subject Matter Expert (SME). This year, I have driven the transition to condition-based asset maintenance from the Medium Term Plan into the Short Term Plan and am now fully responsible for both the sustainment of Phase 1 (covering the first 25% of our key assets) and the activation of Phase 2. Phase 2 will implement condition-based maintenance for a further 25% of our assets at a over 2000 sites in UK, as well as instigating feasibility studies at 5 international locations to assess growth potential.

As part of the Medium Term Plan I have recently delivered a Board-level submission aimed at driving sustainability into our asset base as older items become obsolete. This submission comprised a series of comparative studies, conducted in-house over the preceding 5 years and directed by me, which examined the use of renewable or low-impact materials, such as composites and additive manufacturing, to replace ageing, often Victorian, infrastructure. Another part of the study delivered a complete investment appraisal of our energy needs and suppliers and a third element considered Lean/6S techniques in the Operations space to drive out waste and re-work from routine maintenance. Based on my submission, the Board has decided to re-profile our energy usage and supplier network and to target the worst 25% of our infrastructure for sustainable renewal in the Medium Term Plan. Lean/6S has not been implemented as a stand-alone initiative but I have succeeded in changing the Company's training strategy to include it in annual training for leaders of the Operations function; the techniques can therefore be used prior to our full transition to condition-based maintenance.

On behalf of the Company I have presented on Phase 1 of our transition to condition-based maintenance at the 15th Annual Process Engineering Symposium (London) and on re-profiling our energy supply needs at the annual Sustainable Europe Conference (Berlin). My team has been shortlisted for an industry award for their dedication.

E4: A structured approach to Continuing Professional Development (CPD) that explains both how you have developed your CPD in your career to date and how you plan your future CPD

CPD since election to Member and Short Term:
Due to the large range of plant types and technologies utilised by our business, it is essential to take a serious approach to CPD in order to gain a thorough understanding of the plant we use and to keep abreast of technological advancements. This is to maintain my level of knowledge as a subject matter expert in my field of expertise. To this effect I undertake one of the following every month: attending a seminar/conference/training course, meeting with an industry expert, visiting a manufacturer, benchmarking with other industries or by reading technical papers. The most recent 6 events were:

- Webinar – Energy & Steam – 22/6/21
- Manufacturer visit – z Ltd (pump manufacturers) – 17/5/21
- Panel member of Virtual PRI – 13/4/21
- Read Technical paper – Advanced water treatment in Switzerland – March 21
- Meeting with Dr y, water treatment expert on industry trends – 12/2/21
- Reviewing Engineering Documents – Online Course – 30/1/21

Company X has a comprehensive and structured development programme, in which I both actively participate and promote with my staff. I frequently deliver presentations to Company X, our engineering consultants and contractors to impart the knowledge gained from my CPD; I regularly lead the production of water industry technical specifications. I am an active supporter of the charity WaterAid and regularly organise and lead events, such as the climbing of Munros, which benefits my leadership development skills.

Medium Term:
In the medium term I recognise the need to further my strategic thinking in the engineering environment. I have identified two potential post graduate level modules by UK universities which may give gap closure. In the next six months I will investigate these in more depth and decide if one of them is appropriate to complete.

Long Term:
To support my further career development towards a more senior management role, more business leadership orientated development of my education would be useful. This I currently believe, would be best achieved by completion of a post graduate diploma or even an MBA in business management.

Essential qualities (continued)

E5: The promotion of the engineering profession to young engineers and potential engineers

I actively promote engineering within local schools by supporting engineering design and build challenges. The most recent event involved the mentoring and judging of a robot building challenge for 18 local schools. I additionally work with a local university by providing engineering projects and mentoring to final year MSc students. I am currently mentoring three mechanical students.

Annually for the last 3 years, I have been a guest lecturer at a local university promoting engineering as a career.

I am an active IMechE Professional Review Interviewer, completing 2 days in the last 12 months.

I am an MPDS mentor with currently 3 mentees and over last 5 years 2 of my mentees have achieved Professional Registration.

Additionally, I regularly support and coach engineers through their route to Professional Registration (EngTech, IEng and CEng), with a further 5 achieving registration over the last 3 years.

Desirable qualities

D1: Highly specialist knowledge in a specific area of engineering

A critical engineering area of Company X's assets is the pumping and screening of wastewater. To support the business in this specialised area, I have developed an in-depth knowledge to become a subject matter expert through many years of studying literature, discussions with operators and manufacturers, attendance at conferences and my experience of plant operational requirements and issues. This has included involvement with some of the highest head wastewater pumping stations in Europe.

I currently Chair the industry wide working group on pumping and screening of effluent and am a member of an ISO water industry standards committee. I am the author or lead author of a number of papers published in journals and I have presented at conferences, and I am also a named inventor on Patents and Patents pending.

The most recent examples are:
Operation and control of a water supply system Ref Journal of ABC123 - July 2020
Water supply system hydraulic modelling Ref Journal of DEF456 – November 2019
Advances in water distribution networks – March 2019 (Ref: Conference)
Patent - No. xyz345dbc relating to water supply system
Patent - No. xyz457bdc relating to water treatment and desalination

I headed a detailed study of changing customer behaviours and business requirements and their impact on plant performance, leading to proposals and advice for operational improvements and design changes to suppliers. Suppliers have confidence in my advice, which has been readily accepted e.g. recent changes in rainfall patterns of increased intensity have resulted in enhanced grit content in storm water leading to operational issues. I proposed using a separate fresh water supply for seal cooling/lubrication rather than process fluid in pumps thus prolonging seal life and reducing maintenance.

I have led failure investigations, often supported by statistical studies, to establish root cause and identify design / operational strategies to avoid future issues. I have studied settlement behaviour to support improvements to operational efficiency through equipment selection and mode of operation and promoted research at the University of XXYYZZ to further enhance understanding of this subject, and from 2017-2020 I mentored one of their PhD students.

I have made presentations at public consultations to try and influence behaviour and the avoidance of using the sewage system for the disposal of inappropriate material. My recommendations are readily accepted by executive management when backed by a business case supporting additional expenditure e.g. the use of an invertor drive to sludge pumps with a feedback system responding to changes in the sludge quality as indicated by pressure changes.

I have acted as an expert witness in defence of environmental agency prosecution of company X for alleged excessive dumping of sewage into a river system.

Desirable qualities (continued)

D2: Technical or engineering resource management and/or personnel management and development

As the 'owner' of Company X's Short Term Strategy Plan I am accountable to the Engineering Solutions Manager for an annual budget totalling £XXXm. I deliver quarterly reviews against forecast output to the Engineering Solutions Manager and present a formal Annual Review against allocated budget to the Board, at which point I am accountable for both in-year P&L for engineering and performance against my project deliverables. In terms of physical assets, the 200,000 individual items of plant and machinery owned or operated by the Company are within my responsibility and I enjoy wide autonomy to manage, change and improve their use and efficiency. Intellectual capital and capacity is provided by approximately 75 engineers, of all grades, in my direct reporting chain, plus a similar number of contractors, consultants and Subject Matter Experts (SMEs) on whom I can draw for expert input. I enjoy autonomy to spend up to £Xm annually on engineering consultancy services, for which I account at the Quarterly and Annual Reviews.

Within my teams I have 20 Principal Engineers (a mix of experienced CEng and IEng) who lead their own teams. Throughout my tenure as Chief Engineer I have focussed on their development as leaders, ensuring that they have access to both formal training, such as coaching skills, and to experiential learning opportunities to make them more effective leaders in their own right. This strategy of 'leading through other leaders' has presented us with both challenges and opportunities but, as individuals learn that they are trusted, there has been a demonstrable increase in both performance and innovation; much of the successful project to make Company X more sustainable (see E3 above) grew from these trusted subordinate leaders who felt able to bring forward their ideas and to implement them.

Optional qualities

O1: Responsibility for a budget and the associated risk

As Chief Engineer, I am responsible for managing annual budgets of circa £10m, in support of major and minor engineering projects. I am responsible for the engineering endorsement of all project business cases to the Asset Director and finance department. I am responsible for delegating my overall engineering budget between my Principal Engineers and holding each to account for the financial management in their areas. I chair monthly project reviews and risk working groups where each Principal Engineer presents their project risks for review and sentencing, sharing best practice in the identification and monitoring of financial risk(construction/operational/supply/currency/ political etc). I foster a culture of financial responsibility and transparency by including financial management in my team’s annual appraisals.

Careful oversight and robust risk management has allowed me to bring all my major projects into service within budget for the last 3 years. One example of a recent major project where sound risk management proved important was the introduction of a new pumping station in X; inclement weather significantly impacted the construction schedule and the procurement of key equipment from the US resulted in a considerable cost increase between business case and delivery due to exchange rate fluctuations; these eventualities had been foreseen and with close management and an appropriate initial risk allowance, we were still able to complete the project on budget.

Optional qualities (continued)

O2: Application of a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts

I am responsible for the technical specifications and design approvals for all our engineering assets, for example, storm water pumping stations, water supply sites and sewage treatment plants. A wide range of engineering principles is involved in their analysis - fluid mechanics, corrosion prevention, mechanics, electrical power systems, control systems, instrumentation etc. The designs have to cope with substantial uncertainties, ranging from freak weather to the unpredictable contents of sewage. The design and analysis work is done by the engineers I supervise, but my understanding of the range of techniques and methods they use is crucial when resolving issues and signing off approvals. An example would be my recent decision to add extra back-up systems to a sewage works to improve its resilience in the event of multiple linked equipment malfunctions due to a lightning strike, that I noticed had not been adequately dealt with in the FMEA.

O3: Active development and application of new technologies in engineering and related areas at senior level

In my role as Principal Engineer, I was involved in developing new upgrades to our mechanical and process plant equipment to enhance the treatment of our storm water pumping stations and our water supply sites. This involved me in upgrading our pumping requirements to include pumps of sufficient design enhancements and capabilities to ensure the required water supplies were ensured during periods of drought. I worked with the pump manufacturers in ensuring the correct pumps were designed with the required new enhancements, as determined during the trial testing of the new design, and supplied to our sites to meet our requirements. I conducted an assessment of historical drought conditions at our sites and ensured we had the required storage capability designed to meet our supply demands. This involved me in working with our contractor in designing the new enhanced storage facilities required, in which the contractor utilised the latest new materials available for construction.

In this role, I was also involved on new enhanced sewage treatment plant required to deal with the unpredictable nature of sewage, which can contain chemicals, fuels, fats, etc. As the company Principal Engineer, I managed the team of design contractors working on a new waste water process plant system that provided an enhancement to our sites on how our waste water was treated. The success of this project utilising new technologies meant a significant improvement in our plant efficiencies which resulted in reduced plant downtime, cost benefits overall and were also more environmentally friendly. The new control systems used was the result of an industrial initiative, by a number of software companies, to enhance the process flow conditions which resulted in more effective control of the overall plant process.

In my current role as Chief Engineer, I have ensured that the new technologies, including improvements in system controls, developed in my previous positions have been incorporated in our new mechanical specifications and procedures to ensure these have been captured as “best practice” within these documents.