

Incorporated Engineer: competence statements exemplar

What do we mean by competence?

Professional competence combines knowledge, understanding, skills and values. It's about more than just being able to perform a specific task; it's being able to do it correctly, safely, effectively and consistently.

These competence requirements are based on those specified by the Engineering Council in the UK Standard for Professional Engineering Competence (UK-SPEC).

What characteristics are we looking for?

Incorporated Engineers maintain and manage applications of current and developing technology, and may undertake engineering design, development, manufacture, construction and operation. Incorporated Engineers are variously engaged in technical and commercial management and possess effective interpersonal skills.

A: Apply existing and emerging technology

Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology

A1: How have you maintained and extended a sound theoretical approach to the application of technology in engineering practice?

You could reference your ability to: Identify the limits of own personal knowledge and skills / Strive to extend own technological capability / Broaden and deepen own knowledge base through new applications and techniques

A2: How have you used a sound evidence-based approach to problem solving, and contributed to continuous improvement?

You could reference your ability to: Establish users' requirements for improvement / Use market intelligence and knowledge of technological developments to promote and improve the effectiveness of engineering products, systems and services / Contribute to the evaluation and development of continuous improvement systems / Apply knowledge and experience to investigate and solve problems arising during engineering tasks and implement corrective action

I have developed my expertise in manufacturing engineering and am now recognised as a company expert in lean manufacturing. I am currently working towards my 6 sigma black belt, which will also qualify me to manage and coach other staff in lean manufacturing methodology. I have attended a number of company specific training courses in manufacturing engineering, complemented by on job training to develop my technical competence. Both types of training have been formally assessed and recorded to enable me to take on more responsible roles. I have also attended a national seminar on lean manufacturing at Warwick University and a short course run by the Warwick Manufacturing Group on the use of robots in manufacturing. I produced a report on the latter course, with recommendations for potential applications in my work area. I have been trained in the use of Failure Modes & Effects Analysis (FMEA) and have applied FMEA to manufacturing processes to establish areas of potential risk and failure. I have also acquired expertise in Root Cause Analysis through study and research.

The assembly process for the company's diesel generators requires a large number of critical joints to be torqued to demanding limits. Generators were frequently being rejected during final testing because joints were not correctly torqued and leakage rates exceeded prescribed limits. I manage a small team to investigate the root causes of the failures and researched new tooling capable of improving torque accuracy. I presented a business case for the purchase of the new tooling, oversaw its installation and commissioning and briefed production staff on its use. The percentage of units failing final test due to leakage problems has reduced from 10% to less than 1%, with a cost saving on re-work of £20,000/annum.

B: Application of theoretical and practical methods

Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and re-cycle engineering processes, systems, services and products

B1: How have you identified, reviewed and selected techniques, procedures and methods to undertake engineering tasks?

You could reference your ability to: Select a review methodology / Review the potential for enhancing engineering products, processes, systems and services using evidence from best practice / Establish an action plan to implement the results

B2: How have you contributed to the design and development of engineering solutions?

You could reference your ability to: Contribute to the identification and specification of design and development requirements for engineering products, processes, systems and services / Identify potential operational problems and evaluate possible engineering solutions, taking into account cost, quality, safety, reliability, appearance, fitness of purpose, and environmental impact / Contribute to the design of engineering solutions

B3: How have you implemented design solutions, and contributed to their evaluation?

You could reference your ability to: Secure the resources required for implementation / Implement design solutions taking account of critical constraints / Identify problems during implementation and take corrective action / Contribute to the evaluation of design solutions / Contribute to recommendations for improvement and actively learn from feedback on results

I have contributed to a number of initiatives and investigations to improve manufacturing processes and workflow in the company. Examples include:

- 1) Creation of a new build process for batch orders, taking account of line balancing, part layouts and logistics.
- 2) Introduction of a new hydraulic lifting system for generating sets inside containers to eliminate operator interaction.
- 3) Production of specialised procedures for one-off builds.
- 4) Development and introduction of continuous improvement projects to address health and safety issues.
- 5) Implementation of an Engineering Change process during manufacture to maintain the integrity of the final product.

The main power connections to our generators are fitted during the assembly process. The design of one generator type required access to both sides of the generator on the production line and conflicted with other assembly activities. I provided the manufacturing engineering input to a small team tasked with modifying the design to simplify assembly and remove the activity conflict. I investigated a number of options for consideration by the team by considering the space available, tooling capability and the current assembly line activities. I took care to consult and involve assembly line staff. I approached this element of the task with some trepidation but once I had engaged with the staff I found that their input was extremely useful and as important an element in evaluating alternative options as my engineering based assessments. This was a valuable learning point for me.

I worked with the designer on the task described under B2 above to develop an optimum power connection layout which eliminated the production conflict without affecting the generator functionality. My role in the optimisation study was to analyse assembly line activities for each option, research tooling costs and quantify the costs and benefits of each option. I presented my findings to the task team and we selected a preferred design for implementation. I specified the new tooling for the revised assembly process and subsequently oversaw its installation and commissioning. I briefed staff on the revised procedures and updated assembly documentation.

B: Application of theoretical and practical methods (continued)

There were no major problems with the revised process, the benefits were realised in terms of a 10% improvement in production flow and a corresponding reduction in unscheduled hold-ups on the line. The team was commended via the company's recognition scheme for this improvement. I was also encouraged by the positive feedback from assembly line staff on the improvement in their operating conditions.

C: Technical and commercial management

Provide technical and commercial management

C1: How have you planned for effective project implementation?

You could reference your ability to: Identify the factors affecting the project implementation / Prepare and agree implementation plans and method statements / Secure the necessary resources and confirm roles in project teams / Apply the necessary contractual arrangements with other stakeholders (client, subcontractors, suppliers, etc.)

C2: How have you managed the planning, budgeting and organisation of tasks, people and resources?

You could reference your ability to: Operate appropriate management systems / Work to the agreed quality standards, programme, and budget, within legal and statutory requirements / Manage work teams, coordinating project activities / Identify variations from quality standards, programmes and budgets, and take corrective action / Evaluate performance and recommend improvements

C3: How have you managed teams and developed staff to meet changing technical and managerial needs?

You could reference your ability to: Agree objectives and work plans with teams and individuals / Identify team and individual needs and plan for their development / Manage and support team and individual development / Assess team and individual performance and provide feedback

C4: How have you managed continuous quality improvement?

You could reference your ability to: Ensure the application of quality management principle by team members and colleagues / Manage operations to maintain quality standards / Evaluate projects and make recommendations for improvement

I developed a detailed project plan for the introduction of torque tooling across multiple production bays for a range of the company's products. I analysed the tooling required and produced a specification for the supply of new tooling. I developed a project plan using proprietary software to resource and schedule the procurement, installation and commissioning of the new equipment. I worked closely with the tooling supplier, installation contractor and production managers and staff to 1) ensure that all parties had a shared understanding of the project plan, 2) minimise the impact of the installation on normal production.

I managed implementation of the plan described above. This included the timing of the supply of the new tooling, setting up and managing the installation contract, ensuring compliance with health and safety requirements. I oversaw commissioning and final acceptance of the installation on behalf of the company. I also ensured that production staff were trained in the use of the new equipment and ran a 'lessons learned' workshop at the conclusion of the project. This confirmed the importance of: 1) detailed and realistic planning, 2) stakeholder management for effective project management. The project budget was £250,000 and I was personally accountable to my line manager for approximately half of the contract value.

C: Technical and commercial management (continued)

I have participated in a number of task teams, such as those described under B1, B2 and above. These have required me to liaise with my peers and to manage projects and small investigative / implementation teams involving engineers within and outside the company. More recently, I have managed a team of three engineers and a technician responsible for quality assurance of our assembly processes. This has put me on a steep learning curve in the motivation and development of staff. I have learned to resist the temptation to tackle every problem that comes along, delegate where appropriate and devote more of my time to planning the forward workload, matching tasks to individual skill and experience and identifying personal development needs with team members. I have also learned to prioritise my own time to deal with problems as and when they arise. I have found this a satisfying experience and received valuable feedback on my own behaviours at staff appraisals. I introduced regular planning / feedback meetings with team members, including a regular 'Start the Week' meeting on Monday morning, when I brief staff on company and departmental issues, before reviewing the forward programme for the week. These sessions have greatly improved communications within the team, allowed team members to influence the programme more effectively and generally helped to avoid potential misunderstandings at an early stage.

As part of my role I was charged with the review of the company's Quality Management System (QMS) for the assembly of generating sets. Over the years new procedures and Work Instructions (WI) have been added to the QMS, without necessarily updating existing documents. This has resulted in duplication and conflicting requirements in a number of cases. I formed a small team to review and rationalise the Tier3 documents of the QMS, focussing on detailed Work Instructions and Test Schedules (TS). We eliminated two WIs which overlapped with others and incorporated elements which needed to be retained in other WIs in the suite. One new TS was created and three others updated to reflect current test procedures. I secured approval of the changes by the Quality Assurance Manager and rolled out training sessions to 20 production staff affected by the changes.

D: Effective interpersonal skills

Demonstrate effective interpersonal skills

D1: How have you communicated in English with others at all levels?

You could reference your ability to: Contribute to, chair and record meetings and discussions / Prepare letters, documents and reports on technical matters / Exchange information and provide advice to technical and non-technical colleagues

D2: How have you presented and discussed proposals?

You could reference your ability to: Prepare and deliver appropriate presentations / Manage debates with audiences / Feed the results back to improve the proposals

D3: How have you demonstrated personal and social skills?

You could reference your ability to: Know and manage own emotions, strengths and weaknesses / Be aware of the needs and concerns of others / Be confident and flexible in dealing with new and changing interpersonal situations / Identify, agree and work towards collective goals / Create, maintain and enhance productive working relationships and resolve conflicts

I regularly prepare documents on manufacturing processes and procedures. These include Work Instructions, Maintenance Instructions and Test Schedules. I have contributed to, and authored, a number of assessments resulting from my work on investigative and continuous improvement teams.

D: Effective interpersonal skills (continued)

I have also approved documentation produced by other engineers (e.g. on the QMS review in C4). I have learned that this can require coaching skills and an element of diplomacy in order to achieve the right outcome. A key element of my role is to liaise with design engineers to ensure that designs are fit for manufacture. This often requires me to present logical and convincing arguments in written form for consideration at design review meetings.

I regularly present project progress reports on production line improvements to my peers and senior managers. These typically cover Quality, Time and Cost issues.

I have participated and managed improvement teams and presented the outcomes to a range of audiences. These have included briefing and training sessions to introduce new working practices to production line staff. Here I have learned that securing their 'buy in' early on in a project is a key element to its success. As my experience has grown I have found it easier to engage constructively with staff at all levels in the organisation and have received positive feedback on my performance on several occasions.

The company operates an effective staff appraisal process and I have learned a lot about my personal strengths and areas for improvement. This has been achieved via a combination of formal training courses, on job experience in the roles I have been allocated, 360 degree feedback reviews and self evaluation. I have liaised successfully with my peers in engineering design and manufacturing engineering, production line staff, senior managers and customers. I have developed my listening skills and the ability to mount technical arguments succinctly.

When discharging the team management role described in C3, I learned to be more aware of the needs of team members, their development needs and aspirations. I was pleased to be able to coach one team member, such that he is now authorised to originate Work Instructions under the Quality Management System.

An area of my work I am particularly pleased with is that I have recently started to be involved in customer-facing activity, when our customers visit our facility to discuss their needs and to understand our manufacturing capability. I am being involved in these discussions to bring my knowledge of our capabilities and my ability to help solve customers' problems. This is enabling me to have a much broader perspective which I can bring to my work, and to be able to represent the customers more knowledgeably in internal discussions.

I enjoy working with our sub-contractors and suppliers and try to bring an understanding of their challenges to our relationships. Some of these contracts are based outside the UK and I strive to maintain sensitivity for their cultural differences.

E: Commitment to professional standards

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

E1: How have you complied with relevant codes of conduct?

You could reference your ability to: Comply with the rules of professional conduct of the Institution / Manage work within all relevant legislation and regulatory frameworks including social and employment legislation

E2: How have you managed and applied safe systems of work?

You could reference your ability to: Identify and take responsibility for own obligations for health, safety and welfare issues / Manage systems that satisfy health, safety and welfare requirements / Develop and implement appropriate hazard identification and risk management systems / Manage, evaluate, improve these systems

E3: How have you undertaken engineering activities in a way that contributes to sustainable development?

You could reference your ability to: Operate and act responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously / Provide products and services which maintain and enhance the quality of the environment and community, and meet financial objectives / Understand and encourage stakeholder involvement in sustainable development

E4: How have you carried out continuing professional development (CPD) necessary to maintain and enhance competence in own area of practice?

You could reference your ability to: Undertake reviews of own development needs / Prepare action plans to meet personal and organisational objectives / Carry out planned (and unplanned) CPD activities / Maintain evidence of competence development / Evaluate CPD outcome against action plans / Assist others with their own CPD

I take full responsibility for the work I produce and am authorised to verify the work of my peers in manufacturing engineering. I use risk assessments, FMEAs and job safety analysis when developing new processes. This was demonstrated whilst working on a safe lifting project earlier this year and I am familiar with the relevant legislation (LOLER, PUWER). I am familiar with the IMechE's Code of Conduct and will abide by its principles in my day to day work.

I take full responsibility for my own health and safety and of others who could be affected by my actions. I take a proactive approach to health and safety issues within my area of responsibility. For example, I recently identified a potential hazard associated with cable cutting equipment. I flagged up the hazard, made a successful proposal for new equipment with less operator intervention and oversaw its installation and commissioning. Although initially sceptical, production line staff have since complimented me on its introduction. I maintain a questioning attitude to H&S issues, and have temporarily stopped production when I observed a seriously unsafe practice. I then called together a rapid response team, including production line staff, to resolve the problem.

I am conscious that the company's products require essential raw materials in their construction and that the manufacturing processes we employ inevitably produce waste. I have participated in two improvement projects in the manufacturing area, aimed at reducing the environmental impact of our production processes, one concerned with scrap reduction and one with liquid wastes. Both projects produced environmental benefits and cost savings, demonstrating that a focus on environmental issues can also be commercially beneficial. In the second project I managed a review of all liquid arisings from manufacturing including cutting fluids, lubricants and solvents. I was able to identify up to £25,000 of annual savings by rationalising the number and types of cutting fluids used, improving the collection of waste products and switching to less environmentally damaging and cheaper, cleaning products in some cases.

E: Commitment to professional standards (continued)

I maintain a personal development plan, which is agreed with my manager annually and reviewed with him every three months. This covers both technical and soft skills training. A key current objective is to gain 6 sigma black belt status, which is targeted for completion within the next 12 months.

I have always taken a proactive approach to my development and have sought opportunities to address the UK-SPEC competence standard for IEng. In particular, I requested involvement in the environmental improvement project cited in E3, to gain more exposure to the 'E' competence standard and previously sought project management experience against the 'C' competence standard.

I have supported junior staff where appropriate, particularly graduate engineers joining the company.

If I become a Registered Engineer I am keen to take on a formal mentoring role.
