Engineering Technician: Application exemplar
Section 2: Assessment questions

Question one

1. Give an example of a project or task where you solved a technical problem, explaining your role and how you selected the appropriate techniques, procedures and methods used. Tell us about any scientific, technical or engineering principles you used and how you reported or made recommendations on what you did to your employer or other people involved such as clients or suppliers. Include anything you did to prevent harm to people, equipment or data.

As part of my current scope of work installing a submersible pump in a building sump which could contain radioactive liquid, a replacement radiation shield plug was required for the discharge end of the pipe work.

The standard plug design is of a stepped tube (Ø200x520mm long) filled with concrete. As the new plug required a central hole for the discharge pipe the standard design was not suitable. I was given responsibility to design and procure a new Shield Plug. With previous experience from the use of various shield plugs I knew the standard design was difficult to manoeuvre due to its weight so I reviewed the design of the plug to make it lighter and easier to handle and install. Where the original plug was filled with concrete my design was of a steel modular construction and the steel thickness would have to replace the shielding properties of the concrete to retain the radiological protection to any personnel working in the immediate area.

To obtain the relative thickness of the plug's new material I used the following principle; the density of ordinary concrete is 2300kg/m3 and the density of carbon steel is 7865kg/m3, the concrete is approximately one third the density of carbon steel therefore the new shield plug would have to be approximately one third the length of the existing concrete plug, i.e. 520mm concrete = 173mm steel. I ensured the new steel plug would also be of a stepped design to negate any radioactive shine paths.

Once I was happy with this concept I held a design review with the Safety Department and my Senior Engineer and presented my solution (this protocol is required as the company is ISO 9001 compliant). I received approval for the design and then I disseminated the information to the draughtsmen in the Project Design Office. The information required for the detail design was sent as AutoCAD, Word, PDF and TIF files by me. When the final design drawings were completed I checked them and then arranged for a local engineering company to manufacture the Shield Plug where I acted as the technical point of contact. I have regularly worked with equipment suppliers and clients as this enables good working relationships in the production and installation of equipment thus promoting a safer environment for the public.

In order to successfully install the Shield Plug I provided input to risk assessments involving the lifting of equipment and radiological protection. From previous experience of plant installation and knowledge of safety systems I was able to recommend the use of proprietary PPE for standard safety and radiological working in compliance with the safe systems of work. For example the use of gloves when handling steel fabrications and a review of the facility's radiation map to assess working times, personnel and equipment positioning.

From a personal perspective when I work on a nuclear plant and in order to gain access to the facility I have to complete a rigorous safety procedure to ensure my personal radiation is not above 15mSv/yr.

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Question two

2. Give an example of how you have identified, planned, and organised the resources needed to effectively complete a project, explaining how you took into consideration cost, quality, safety and any environmental impact. Remember to think about what equipment was used, how data was gathered and analysed and how you initiated the project to produce the desired outcome.

Due to my engineering knowledge of pipework in the Oil and Gas industry I was tasked to arrange a trial on site to show the benefits of using dry ice blasting against grit blasting for salt removal in paint preparation of carbon steel pipework used in the Oil and Gas industry (due to the close proximity of the coast, salt removal was the main consideration). If successful this would deliver both a cost and environmental benefit for our company.

Firstly to understand this concept more fully I investigated the use of this technology on the internet and then made contact and spoke with some industry experts and suppliers. I then developed a plan outlining the resources required, the safety and environmental considerations (as our company is ISO 14001 approved) and estimated an approximate cost of the testwork. I also reviewed the technical specifications and standards required (American Petroleum Industry Standards) and assisted the Senior Engineer to conduct a Risk Assessment where I recommended the use of the PPE for the dry ice blasting. I then inquired about the security clearance required to bring contractors on site, the use of a rig hall for the demonstration, the provision of a dry compressed air supply and acquired corroded pipe for the test.

As I collated all the information, equipment and procedures it became apparent the chosen rig hall on site was unsuitable for the trial, mainly due to security clearance and noise issues, so I advised my Senior Engineer of this issue. I then contacted a local engineering company to arrange a meeting to enquire if they would hold the trial in one of their fabrication workshops: the company was in full agreement as they could also promote themselves and the cost of the workshop hire was negated. I could then invite personnel from other companies who showed an interest in the trial thus removing the time and cost of security clearance. The dry ice blasting company provided the PPE and hired a compressor for the trial.

As there were domestic residences close to the workshop the trial took place during the mid-afternoon to keep noise disturbance at a minimum and within a more acceptable part of the working day. The trial was a success confirmed by tests to assess the salt content before and after cleaning, the reduction was quite significant and as the dry ice sublimes there is no extra material to clear away as there is in grit blasting. As there is no residue after the dry ice blasting this process is also environmentally friendly.

This technology is now used on a regular basis by my company and I worked with the Senior Engineer to formalise this procedure into a company specification and now give training to other Technicians on this method of preparing carbon steel pipework and plant equipment for painting.

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Question three

3. Give an example of how you have complied with the Institution's Code of Conduct, how you keep in touch with developments in your technical area and how you have continued to develop your knowledge and skills?

I have read, understood and will comply with my Company and the IMechE Codes of Conduct and will act as a professional engineer and promote the engineering profession wherever possible. I will conduct my professional work with integrity and always ensure that I am aware of my limitations. An example of this is when a client asked me to give advice and approve some structural calculations for some heavy duty pipe supports. I politely informed the client that I was not in a position to be able to approve the calculations as I was not authorised to do so by my company and referred this to my Senior Engineer who was authorised.

I adhere to Health and Safety at Work Act 1974 and am conversant with API Standards and the various Nuclear Safety Standards.

I have an annual appraisal with my Senior Engineer and this is when we discuss my training and development requirements, from this discussion my objectives for the year are agreed and set. I am measured against my objectives and they form the basis of our company bonus scheme.

One of my objectives for the forthcoming year and as part of my continuing professional development is the training in the use of Autodesk Inventor to aid the department in the design of decommissioning equipment. As I would like to progress within the company in the future and get to Senior Engineer level in the next five years I will start a part time Open University Engineering Degree course in September.

I also attend Learning From Experience (LFE) meetings to gain knowledge and experience of problems resolved and of good working practices from the members of the various teams I have been working with.

I am a participating member of the company's Computer Aided Engineering Centre of Expertise with responsibility for AutoCAD requirements such as reviews of user background, development and guidance on CAE training, development of standards & guidance and the performance of appropriate project audits and reviews.

I am responsible for the training of the Company's new Apprentice intake in the compliance of the Company's AutoCAD procedures and Draughting Standards. I instigated the setting up of a computer training room complete with all software requirements for access to AutoCAD and directories containing instruction documents and drawing files which I had prepared.

I am a member of the Nuclear Engineering Society and read their regular publications and attend their events; an example of this being a seminar on decommissioning nuclear plant and equipment.

If successful in my application of membership to the IMechE I would plan to attend their events. I am involved as a mentor to new and existing time served draughtsmen and access to the IMechE's library would enhance my effectiveness in this role. I also plan to become a STEM Ambassador in the near future.

I am also an active member of the Triumph TR Drivers club and drive the car I have renovated over the past three years at club events.