How To Write Your SUMMARY STATEMENT

WELCOME!

Welcome to our FREE Summary Statement Writing Guide — a valuable resource crafted to assist you in navigating the intricacies of creating a successful Competency Demonstration Report (CDR).

We understand the significance of a well-crafted Summary Statement in showcasing your engineering competences and crafted this guide just to help you with that.

This guide is designed to provide insights, tips, and examples to help you understand the essential elements of an effective Summary Statement. Each example within this guide should serve as a reference point, offering inspiration and guidance as you embark on crafting your own unique Summary Statement.

Remember, your CDR is a reflection of your individual experiences and achievements. If you have **any questions** or need further assistance along the way, our team is here to help.

Introduction:

This is a guide on how to fill the Summary Statement document, and more specifically for the category of the Professional Engineers. This part of the CDR preparation is the most confusing for applicants, and at the same time the most crucial for the EA evaluators. CDRSample.com is attempting to enlighten you through this easily understandable and comprehensive guide which explains each element and indicator in detail. The guide was created to "decode" Engineers Australia requirements while it also contains examples on how to fill each indicator for every one of the Summary Statement's elements.

The Summary Statement is basically an index of the applicant's competencies, and most important activities that relate to the engineering discipline. It is used for an overall evaluation of how the applicant showcased his knowledge and skills on the work experiences presented in the three submitted career episodes. For this reason, it is crucial to fill in every section of the Summary Statement with the correct corresponding paragraph number from the career episodes, and to do so without neglecting any entries that could enrich the quality of the document.

We at CDRSample have the experience and expertise to understand the requirements of each section of the Summary Statement, and we also possess the knowledge of how to fill in each element of competency in a comprehensive manner. Besides offering our services, we also care about sharing our specialized knowledge in this area, essentially helping engineers better understand what we do and on what basis we do it.

Enjoy this guide, and feel free to contact us at cdr@cdrsample.com if you have any questions.

Section 1 – Knowledge and Skill Base

The first of the three parts of the Summary Statement is dedicated to the knowledge and skill base of the applicant. On this part, applicants will have to showcase their theoretical understanding, research work, expertise in key areas, ability to conduct numerical analysis, utilization of software tools, and compliance with codes and standard engineering practices. All this indicates how solid is the applicant's basis, upon which the successful application of engineering practices can occur.

Element 1.1: *Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.*

This is the first element of the Summary Statement document and so filling it right holds special importance. Let's take a look on what the first section concerns and what parts of your job experience you can populate it with.

For this element of competency, there is one indicator that needs to be filled and this is in regard to the generic engagement of engineering disciplines at a phenomenological level. This basically means that you can fill the indicator with tasks that showcase a fundamental engineering understanding through common practice skills applied to a broad range of systematic investigation, problem analysis and development of innovative solutions.

You can use Career Episode clauses that highlight adherence to generic engineering fundamentals. These clauses may be about the development of a solution to a problem, done through solid engineering conclusions based on analysis of data, or how you prevented an error from being realized by taking precautions that underlie fundamental engineering principles.

To make things clearer, when we talk about an understanding of “natural and physical sciences” we basically mean sciences like Astronomy, Biology, Chemistry, Physics etc, so the last two could apply to an engineer. The “engineering fundamentals” on the other side could be the Thermodynamics, the electrical circuit design fundamentals, the Newton's laws etc.

Here are some indicative examples for filling the indicator:

1.) My conceptual understanding of Heat Transfer engineering in relation to oil plant safety, led me to the development of a modification on the piping network arrangement that would increase the efficiency and safety of operation of the processing unit.

2.) Knowing Ohm's law imperatives in circuit design, I checked all the electrical schemes developed by the drafting team.

3.) I designed the heating, ventilation and air conditioning vents by utilizing my knowledge and experience in the field of the Fluid Mechanics.

Element 1.2: *"Conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline."*

The second element of the Summary Statement document concerns the familiarity of the applicant with certain basic engineering-related disciplines. These disciples are the mathematics, numerical and statistical analysis, computer and information science. All of those form the basis on which a modern engineer can build up investigation and analysis processes, assess or predict a problem, model a system and finally take technically sound decisions.

As the scope of those disciples is very wide and their importance is big, one can safely say that the engineering activities that can be enhanced by applying them is widely expanding in the areas of professional communication, systems monitoring, testing evaluation, data comparison, knowledge exchange and management, and finally more accurate and valid measurements.

There is only one indicator that corresponds to the second element of the first table of the Summary Statement document and this indicator can be filled with examples that showcase how the applicant developed and fluently applied processes that utilize any embodiment and facet of those disciples. This means that the indicator is usually filled with cases of systematic utilization of processes that require a professional level of mathematical knowledge, ability to conduct engineering investigation through analytical thinking, capacity to identify and discard errors in measurements through statistical analysis, and finally the competence to predict changes in the operational characteristics of a system by simulating it on computer.

Here are a few examples on how to fill this particular indicator:

1.) Using my knowledge on Calculus, I determined the optimal size of the custom truck platform based on the size of packages and maximum allowed hauling weight.

2.) Statistical analysis of the wind forces on the bridge location revealed the critical points that needed further reinforcement.

3.) The MATLAB Simulink simulation that I set up and ran confirmed the advisability of my initial schematic approach.

4.) In my work on all my projects I have performed various technical calculations.

Element 1.3: *"In-depth understanding of specialist bodies of knowledge within the engineering discipline."*

In the third element of the Summary Statement document, applicants have to showcase their ability to apply advanced technical knowledge and skills in the practice domain of the selected engineering discipline. Engineering disciplines are: Mechanical Engineering, Civil Engineering, Electronics Engineering etc.

In order to better understand how to fill the one indicator of the third element, we need to first describe what the "specialist practice domain" is. According to EA's latest booklet (page-25), this term is defined as "the specific area of knowledge and practice within an engineering discipline, such as geotechnics, power systems, manufacturing process, etc".

We would like to expand this and provide some more examples of what "specialist practice domain" is:

- for Mechanical Engineers: robotics, internal combustion engines, industrial production equipment.
- for Civil Engineers: geotechnics, structural integrity evaluation, road and highway engineering
- for Electronics Engineering: circuitry design, PLC programming, computer software, communication equipment.
- for Petroleum Engineers: drilling and geotechnics, plant control and management, , fluid mechanics.
- For Chemical Engineers: Front End Engineering Design (FEED), Chemical process design, Chemical equipment design.
- for Aeronautical Engineering: aerospace engineering, aerodynamics, jet propulsion, aircraft frame design.
- for Agricultural Engineers: agricultural machines and farm equipment, natural resources, geotechnics.

For all the specific skills and technical knowledge needed to fill the indicator, the applicant must consider the characteristics of the chosen occupation category (ANZSCO code). Find a list with all Engineering codes on the Australian Bureau of Statistics website.

Here are a few examples to consider when filling this element in your Summary Statement,

1.) I possess advanced skills in production planning and I utilize these skills for successful completion of my projects..

2.) I am conversant in using and applying telecom engineering and networking equipment in mega infrastructures.

3.) I have proven knowledge of fluid dynamics which I applied in my projects.

4.) I developed a maximum efficiency production plan in the manufacturing plant.

5.) I was responsible for all mud engineering work during the project.

Element 1.4: *"Discernment of knowledge development and research directions within the engineering discipline."*

In the fourth element of the first section of the Summary Statement document, applicants have to focus on experience examples that highlight their close attention to the latest developments in their engineering discipline and practice domain, as well as the ability to search, identify, select and utilize technical literature and/or other specialized informative sources.

There are two indicators that need to be filled on this element and those are:

a) Identifies and critically appraises current developments, advanced technologies, emerging issues and interdisciplinary linkages in at least one specialist practice domain of the engineering discipline.

b.) Interprets and applies selected research literature to inform engineering application in at least one specialist domain of the engineering discipline.

The first indicator could be filled with examples of the applicant identifying pioneering solutions through research, learning about specific modern techniques and work methods that are at least tentatively proved to be successful in the real-world industry or in the lab environment, and finally identify theoretical and practical connection and/or interrelation between two or more engineering disciplines.

The second indicator concerns the applicants' research activities and so its focused around information evaluation, research methodology, systematic utilization of selected technical literature, engineering books, operator's manuals, and manufacturer's handbooks.

Some examples that can be used on this part of the Summary Statement are found below:

1.) I was a subscriber of the "Modern Engineer" magazine, and so I remained informed about the latest developments in my field of profession.

2.) I leveraged the company's library and used technical books that contained mathematical formulas that I needed for the design of my systems.

3.) I learned about innovative methodologies for the installation of pumping systems, challenging established practice methods in the field with beneficial end results.

4.) I regularly visited my University's library to search for relevant scholar material and took notes of my findings for further research in future sessions.

5.) I used the internet in a daily basis to get updated about the most pioneering solutions applied in problems similar to those I was facing during my projects.

Element 1.5: *"Knowledge of contextual factors impacting the engineering discipline."*

Before we start describing the individual indicators of attainment for this element, let's try to "decode" its title first. The "contextual factors" are all of those things that are coherent or relevant to the engineering discipline. Engineering disciplines are: Mechanical Engineering, Civil Engineering, Electrical Engineering, etc.

So, applicants can think of it this way: a contextual factor for Electrical Engineering could be a set of safety precautions relating to electricity hazard prevention. A contextual factor for Civil Engineering could be the national earthquake regulations, choice of suitable technicians to work on raised platforms, or even the accounting of weather conditions during the mixture of cement.

a.) Identifies and understands the interactions between engineering systems and people in the social, cultural, environmental, commercial, legal and political contexts in which they operate, including both the positive role of engineering in sustainable development and the potentially adverse impacts of engineering activity in the engineering discipline.

Example on "cultural" context: To develop a shift plan of maximum efficiency for my project, I took into account the praying time intervals for Muslim workers.

Example on "environmental" context: To achieve a minimum disposal of polluting heavy metals into the ground of the site, I subjected the effluent water to an electrowinning / precipitation (CEP) process.

Example on "legal" context: I visited the Urban Planning office to get informed about the legislative requirements that I had to respect in my designs.

b.) Is aware of the founding principles of human factors relevant to the engineering discipline.

Example: I designed the monitor and control panel interface to be ergonomic, in order to minimize errors. I also placed the screen at the median eye-sight height of the four operators.

Example: For the design of the new production line, I took into account the good in-work environment climate and adequate air-flow, ensured intense lighting in all areas, and provisioned the placement of noise stoppers and vibration absorbers around the machines. This secured a pleasant working environment for the workers.

c.) Is aware of the fundamentals of business and enterprise management.

Example: I planned the project schedule, organized the execution of all tasks, coordinated employees, and controlled the outflow of the project's financial resources.

d.) Identifies the structure, roles and capabilities of the engineering workforce.

Example: I asked the workers to fill in a form about fear of heights and use of medication before I selected the scaffolding technicians.

e.) Appreciates the issues associated with international engineering practice and global operating contexts.

Example: Knowing that my reports and technical manuals could be widely used to help technicians that use the equipment around the globe, I decided to write them in English.

Element 1.6: *"Understanding the scope principles, norms, accountabilities and bounds of contemporary engineering practice in the engineering discipline."*

The sixth section calls for the highlighting of the applicant's understanding around standards, norms, code sets, and globally established engineering methods of practice in the engineering discipline. To remind, engineering disciplines are: Mechanical Engineering, Civil Engineering, Electrical Engineering etc.

What this means is that the applicant has to demonstrate the knowledge of engineering standards that are applicable in several different aspects of a project such as work safety, environmental protection, legislative requirements and limitations, engineering design methodology and common practice. The applicant must also showcase basic project management activities, as well as the capacity to manage resources effectively.

a.) Applies systematic principles of engineering design relevant to the engineering discipline.

Example: I performed the embodiment design before proceeding to detailed drawings to determine if the draft concept was efficient enough.

Example: I used different design layers for the HVAC and the electric circuitry network in AutoCAD. This helped the printing of independent schematics for their distribution to different teams of technicians.

b.) Appreciates the basis and relevance of standards and codes of practice, as well as legislative and statutory requirements applicable to the engineering discipline.

Example: For the design of the new communications antenna, I considered the suggested specifications provided by the IEEE (Institute of Electrical and Electronics Engineers) 145-2013 standards.

Example: I designed and commissioned the new turning machine production line in full accordance with the ISO (International Standards Organization) 23125:2015 standards.

c.) Appreciates the principles of safety engineering, risk management and the health and safety responsibilities of the professional engineer, including legislative requirements applicable to the engineering discipline.

Example: During the project works, I ensured that all procedures respected the limitations set by the Occupational Safety and Health (OSH) international regulations.

Example: As the hauling trucks were old and didn't feature any protective equipment, I designed, manufactured and installed steel rollover bars to protect the drivers in case of a road accident.

d.) Appreciates the social, environmental and economic principles of sustainable engineering practice.

Example: I designed a filtering system that purified the toxic air that was generated during the plastic molding stage, so it could be deposited into the environment without the company having to pay the environmental encumbrance fees.

Example: I modified the piping system in such a way that the previously discharged hot water from the production line would be re-circulated once more through the offices, thus lowering the heating costs for the company.

e.) Understands the fundamental principles of engineering project management as a basis for planning, organizing and managing resources.

Example: During our meetings, I distributed work tasks equally to all participants. This helped finish the project in time.

Example: I used Microsoft Primavera to plan the project activities and develop the most efficient schedule based on the available resources.

f.) Appreciates the formal structures and methodologies of systems engineering as a holistic basis for managing complexity and sustainability in engineering practice.

I followed engineering design change methodology in all of my projects, to manage work efficiently and keep track for future reference.

Section 2 – Engineering Application Ability

The second part of the Summary Statement concerns the applicant's ability to put his knowledge and skills into actual practice, and do so in an effective and efficient manner. In this part, applicants will have to demonstrate their problem-solving abilities, the way they evaluated and selected among the available tools and resources, how they developed systems through engineering design, and how they contributed to the management of the projects. On this part, the highlights of the engineering work in the three career episodes are reflected.

Element 2.1: *"Application of established engineering methods to complex engineering problem solving."*

While the first section of the Summary Statement concerned the "Knowledge and Skills Base", the second one is in regards to the "Engineering Application Ability". This means that applicants will need to match clauses from their three Career Episode documents that describe practical engineering work. As the title of section 2.1 suggests, applicants are expected to highlight the cases where they acted in the context of established engineering methods to solve complex technical problems.

This is a very important competency as problem solving in engineering calls for the utilization of multiple principles, and a wide spectrum of specialized knowledge in practical engineering. This is perfectly reflected by the relatively large number of different indicators that correspond to this element of competency. On this first part, we will analyze and provide examples for the first three indicators of attainment.

a.) Identifies, discerns and characterizes salient issues, determines and analyzes causes and effects, justifies and applies appropriate simplifying assumptions, predicts performance and behavior, synthesizes solution strategies and develops substantiated conclusions.

Example: I investigated the tank overflow problem by conducting chemical analysis of the contained liquid. This revealed water contamination which led my investigation to the water pump that was the source of the problem.

Example: I predicted that the installation of three additional milling machines would require 24% more electric power from the grid. Thus, I proposed the installation of a 200 KiloWatt generator.

Example: I instructed four technicians to take position in different points of the line and measure the output voltage. This way, I was able to find out if the drop was because of the Ferranti effect, or due to a technical problem.

b.) Ensures that all aspects of an engineering activity are soundly based on fundamental principles – by diagnosing, and taking appropriate action with data, calculations, results, proposals, processes, practices and documented information that may be ill-founded, illogical, erroneous, unreliable or unrealistic.

Example: I ensured that the power system was working according to the specifications by comparing the critical operation data with the values indicated by "load to power" tables found in the manufacturer's manual.

Example: The supplier didn't have available replacement gears for the product conveyor belts, so I designed an alternative gear arrangement by calculating the required module, teeth number and height, pitch diameter, and pressure angles.

c.) Competently addresses engineering problems involving uncertainty, ambiguity, imprecise information and wide-ranging and sometimes conflicting technical and non-technical factors.

Example: While the specifications of the proposed electric generator indicated that it would cover the plant's power needs, wherever the same model was implemented there were frequent power outages. I run a power system simulation on ETAP and located reliability issues caused by unequal load flow.

Example: Submerging the temperature sensors in the oil tank resulted in greatly deviating values. As I didn't have a third sensor to test and determine which one was defective, I put both inside a jar containing hydrogen, and used a spectrometer to find out the correct temperature.

d) Partitions problems, processes or systems into manageable elements for the purposes of analysis, modeling or design and then re-combines to form a whole, with the integrity and performance of the overall system as the paramount consideration.

Example: Due to the fact that the milling of the workpiece was performed in multiple stages, I had to set up quality testing checkpoints in five different spots in order to figure out the source of the defective processing. I divided the process into stages to enable thorough investigation.

Example: In order to speed up the production of the metal clips, I divided the processing procedure into four distinct phases (melting, molding, post-processing, painting) that were performed by personnel that was dedicated to specific and narrow-responsibility roles.

e) Conceptualizes alternative engineering approaches and evaluates potential outcomes against appropriate criteria to justify an optimal solution choice.

Example: Based on my calculations, I knew that the electric power generator would be inadequate during rush hours, and so I proposed the installation of an additional solar panel to cover the extra energy demand.

Example: Although manufacturing the glass frames on 3D printers was apparently faster, the time needed for product polishing exceeded the financial benefits by far, and so I proposed the limitation of 3D printers for the production of prototypes only.

f) Critically reviews and applies relevant standards and codes of practice underpinning the engineering discipline and nominated specializations.

Example: The preliminary project scope document suggested the use of quality standards but didn't mention any particular sets. I decided to follow the guidelines described on the ISO 9001:2015 set as those are internationally accepted.

Example: I chose the safety equipment supplier by conducting impact and material strength tests on the provided helmets, according to the requirements of the ASTM (American Society for Testing and Materials) F1446-13 guidelines.

g) Identifies, quantifies, mitigates and manages technical, health, environmental, safety and other contextual risks associated with engineering application in the designated engineering discipline.

Example: As the barrels containing toxic materials were stored in the warehouse and remained there for a period of time until their transport and disposal, I implemented an indoor air ventilation system that ensured constant and adequate air-flow and decontamination through carbon filtering.

Example: I strongly advised the recently hired oil pipe technicians to use no-spark wrenches while clenching the pipe sections. This limited the possibility for a fire accident when working on active /operating lines.

h) Interprets and ensures compliance with relevant legislative and statutory requirements applicable to the engineering discipline.

Example: I contacted the National Urban Planning agency to get informed about the requirements and documents that I should prepare in order to receive the permission to lay the foundations of the buildings complex.

Example: I managed to fulfill all legislative requirements without any delays, as my designs were already fully compatible with IRC (International Residential Code).

i) Investigates complex problems using research-based knowledge and research methods.

Example: As I had never encountered a plastic pipe leak inside a concrete wall before, I searched for tested and established problem mitigation methods on Google Books and also asked for expert advice in engineerings forums.

Example: I researched for all books tagged as “Geo-technical Engineering” in my University's library, and I also asked for the advice of my lab professor on the technical implications faced with the building foundation layers.

Element 2.2: *"Fluent application of engineering techniques, tools and resources."*

In this part of the Summary Statement, applicants need to focus on the demonstration of their ability to proficiently select and use tools and resources that were made available to them during the projects described in the three Career Episodes, and also showcase the fluent application of specific engineering work methods. This does not only concern tools and resources in the traditional sense, but also everything else that may reside in the context of the term like books, technical information websites, experiment results, simulation data, and highly-specialized equipment.

The importance of this element of competency is considered to be very high as this is the point where applicants have to prove the existence of a core part of their skillset in a professional level. This importance and wide spectrum covered by element 2.2 is reflected by the fact that there are ten different indicators of attainment that correspond to this part of the document. Because of the limited extent of this document, we will show how you can fill the first two indicators with the use of examples, while the rest of the indicators will be covered in the following weeks.

a.) Proficiently identifies, selects and applies the materials, components, devices, systems, processes, resources, plant and equipment relevant to the engineering discipline.

Example: I identified that the use of Tantalum-based compounds in the semiconductors production would significantly decrease the Errors per Million rate for the produced solid state drives, and so I suggested the relevant change in the process.

Example: I selected the proper pipe cutting tool after determining the pipe material hardness, diameter, and pipe wall thickness from datasheets, and its underground morphology from the on-site schematics.

b.) Constructs or selects and applies from a qualitative description of a phenomenon, process, system, component or device a mathematical, physical or computational model based on fundamental scientific principles and justifiable simplifying assumptions.

Example: I used the finite element method on Autodesk FEA to generate a numerical as well as illustrative solution to the heat equation of the newly designed pump casing model.

Example: I modeled the semiconductor with its P-N junctions to simulate the micro-electronic circuit in order to define the stress voltage and current in the diodes.

c.) Determines properties, performance, safe working limits, failure modes, and other inherent parameters of materials, components and systems relevant to the engineering discipline.

Example: To ensure the safety of the workers, I programmed a micro-controller to detect high operating temperatures from connected sensors positioned in key points, and perform auto-shutdown of the system until temperatures are back to normal range.

Example: I calculated the buoyancy and center of mass of the floating platform in order to develop the most efficient and safest lodge loading method.

d.) Applies a wide range of engineering tools for analysis, simulation, visualisation, synthesis and design, including assessing the accuracy and limitations of such tools, and validation of their

results.

Example: I used MATLAB Simulink to test the system at software simulation level. I used the theoretic output data for comparison with the real data yielded by the lab tests on the circuit prototype.

Example: I managed to reduce the piping weight and cost by performing multiple flow simulation sessions in Solidworks. This helped lower the mass fraction through minor curve normalization in critical points.

e.) Applies formal systems engineering methods to address the planning and execution of complex, problem solving and engineering projects.

Example: I applied computer-aided verification of the customer's feedback validity. I wrote a script that attempted to relate the ticket details with entries in the knowledge database before assigning the proper tag and sending the ticket to the customer service department.

Example: As the product would be the result of the collaboration of multiple teams, I set up a central dashboard with a kanban board designed especially for this project in our company's cloud network. This helped track the progress of each task, and allowed me to relocate personnel to sectors that showed troublesome advancement.

f.) Designs and conducts experiments, analyses and interprets result data and formulates reliable conclusions.

Example: I designed an experiment according to which a set of product samples that featured different paint coating would be subjected to intense ultraviolet light for twenty minutes, thus emulating long-term exposure to Sun rays. This way, I determined the mean material decay rate in relation to the coating used.

Example: I used an acrylic replica of the actual hook to determine the stress concentration under polarized light. This allowed me to locate weak points where cracks could develop over time in industrial-grade applications.

g) Analyses sources of error in applied models and experiments; eliminates, minimises or compensates for such errors; quantifies significance of errors to any conclusions drawn.

Example: While conducting the LED vs Halogen light experiment to determine which one was the most suitable choice for my purpose, I noticed significant deviations in the measurements. This was due to my failure to account for the ambient light factor which was randomly affecting the results of my experiment.

Example: I devised an experiment that measured the exact dimension of the nanogears using laser micrometers positioned in such a way, that a 3D model could be generated out of the data. However, the model was inconsistent, and I found the reasons to be bad calibration in one of the instruments, and the limited max output precision data of another.

h) Safely applies laboratory, test and experimental procedures appropriate to the engineering discipline.

Example: Before initiating the experiments, I ensured that there was enough safety equipment available in the lab for all the personnel involved. I ordered goggles, gloves, calipers, boots, and I submitted an official suggestion for lighting and ventilation system upgrade.

Example: I organized a training session about electric hazards prevention, so that the testing engineers knew how to protect themselves from the dangers of activated circuits.

i) Understands the need for systematic management of the acquisition, commissioning, operation, upgrade, monitoring and maintenance of engineering plant, facilities, equipment and systems.

Example: I installed a level monitoring sensor on the metal bar cartridges, so whenever it dropped below a certain level, a signal would be sent to the warehouse manager. This ensured the in-time refilling of the cartridge, and secured the continuous operation of the plant.

Example: I planned the upgrading of the electric motors network in the plant according to their position, max load, and connectivity importance. The motors were divided into five teams and whenever one batch was replaced, the rest would handle the extra load working at a higher rate, thus keeping the plant operational.

j) Understands the role of quality management systems, tools and processes within a culture of continuous improvement.

Example: I established a registration system for the arriving parts, so that whenever something was found to be defective, I could locate the vendor and batch number, and ask for a replacement part, or a refund.

Example: I fully implemented the ISO 14001 quality management requirements in the waste management system of the plant. Every existing system was judged based on the environmental protection criteria of the particular standard set.

Element 2.3: *"Application of systematic engineering synthesis and design processes."*

This is a central part of the Summary Statement document as it concerns an important aspect of ones engineering ability, which is the skillset that underlies the engineering design. For the design of a new system, an Engineer has to combine a wide spectrum of specialized knowledge and skills, and take into account a rich set of affecting factors and elements that play a role in the design.

In this element, applicants must showcase the ability to define the project requirements, identify the various factors involved, categorize them properly, and finally combine them successfully in the context of a system's design. In this tutorial, we take a look at the first two of the four in total indicators of attainment of this element.

a.) Proficiently applies technical knowledge and open ended problem solving skills as well as appropriate tools and resources to design components, elements, systems, plant, facilities and/or processes to satisfy user requirements.

Example: I first designed and developed a scaled prototype of the production robot, in order to determine the forces that the arm would be required to endure with great accuracy. I then scaled up this model using an adaptive scaling methodology to develop my final design.

Example: I defined the user requirements after conducting a series of interviews with customers that had purchased and used the previous version of the drilling tool. This helped me devise the original design to enhance its most cherished properties and in the same time mitigate all of the noted drawbacks.

b.) Addresses broad contextual constraints such as social, cultural, environmental, commercial, legal, political and human factors, as well as health, safety and sustainability imperatives as an integral part of the design process.

Example: Knowing that the product design would be should be in compliance with both the engineering and the legal department requirements, I asked representatives from both to provide the absolute limits as those were set by their studies. This helped me design a product that required little modifications before reaching its final state, dropping the rapid prototyping cost and time greatly.

Example: I designed the new chimney to be in full accordance with the environmental regulations of the country, and also implemented a three-stage filtering system that would lower the rate of heavy metals deposition into the air around the plant.

c.) Executes and leads a whole systems design cycle approach. (for a more detailed description on this one, check EA's booklet)

Example: I created a scaled down version of the platform, in order to conduct additional tests that would help me ensure that the particular design offers adequate buoyancy for the carrying of the shipments.

Example: I pre-estimated what parts would be needed, and I also provisioned for the availability of the required tools that would be needed during the assembly procedure. I did this by studying the manufacturer's parts diagram.

Example: I chose a railed platform design against the option of a legged one as this design was estimated to compensate the extra cost in a year, due to the fact that there would be no forklift involvement required for the positioning of the platform in front of the loading/unloading decks.

Example: Due to the nature of the crane, I had to design it while conducting tipping tests in the same time. This way I ensured that the crane would not cause any accidents while operating at the suggested limits.

d.) Is aware of the accountabilities of the professional engineer in relation to the 'design authority' role.

Example: During the buildings design phase, I acted as an expert consultant for the client, checking the drawings and ensuring that all aspects of the design were in full compliance with the project requirements. Based on these evaluations, I gave my approval on the designs, or submitted a statement for modification.

Example: As the Senior Designer in the project, I set three stages of design evaluation for the various designs (building, HVAC, plumbing). The first was a preliminary check conducted by me, the second involved the calculation of the generated forces in all elements in the designed networks, and the third was an individual simulation of the designed systems on structural and static forces analysis software, and fluid flow simulation tools.

Element 2.4: *"Application of systematic approaches to the conduct and management of engineering projects."*

Although this element doesn't directly concern the applicant's engineering skills, it remains a key component of the document. This is because it requires a demonstration of the applicant's ability to work on all of the side-factors that underlie a successful engineering project. Those side-factors are still directly related to important engineering work such as systems design, implementation, and project planning.

a.) Contributes to and/or manages complex engineering project activity as a member and/or as leader of an engineering team.

Example: I prepared a risk evaluation report that helped me mitigate any probable risks, and also indicated the main points that would be used for the development of a contingency plan to increase preparedness and help me address any problems quickly.

Example: As a member of the R&D team, my role was to evaluate the information found and provided by the other members, and to validate its rightfulness and relevance to the project.

Example: Initially, I organized a meeting with my team in order to distribute the tasks and the corresponding workload equally to all of the attendees. This guaranteed a steady and unobstructed progress for the project.

b.) Seeks out the requirements and associated resources and realistically assesses the scope, dimensions, scale of effort and indicative costs of a complex engineering project.

Example: Each month, I performed an estimation of the required manpower, equipment, and materials for the completion of the tasks that were planned for the upcoming month. This helped me coordinate the ongoing on-site activities with the issuing of permits from the finance and procurement department.

Example: Based on the IEEE standards and technical suggestions, I calculated the required number of fuses that should be implemented in this kind of networks, in order to achieve a safely operating power network. This helped me estimate the cost for the acquisition of the components beforehand.

Example: I studied the manufacturer's technical manual and compared the maintenance schedule with the service logbooks to find out what should be done in the next session. Based on my findings, I developed a Bill of Quantities for the parts that should be ordered from the supplier.

c.) Accommodates relevant contextual issues into all phases of engineering project work, including the fundamentals of business planning and financial management.

Example: The project planning was ongoing and under formation at all times, as I collaborated closely with the financial department in order to stay in touch with the latest market trends that helped me steer the R&D activities to more profitable areas.

Example: I established a project planning cycle consisting of the review, revise and the modify phase. This cycle was repeated every month, so the project was always staying on track and in accordance to any changes in the requirements.

d.) Proficiently applies basic systems engineering and/or project management tools and processes to the planning and execution of project work, targeting the delivery of a significant outcome to a professional standard.

Example: I introduced the Six Sigma set of techniques in the company, helping the manufacturing plant work more efficiently without investing anything from the available financial resources.

Example: By applying a Kepner-Tregoe analysis, I successfully replaced job activities that weren't as efficient as others could possibly be, and justified each item replacement with the corresponding numerical rating data.

e.) Is aware of the need to plan and quantify performance over the full life-cycle of a project, managing engineering performance within the overall implementation context.

Example: I used Kanban boards combined with lead and cycle times data to quantify the performance of each employee and each department individually, so that I could adjust the resources engagement sector to achieve a better overall performance.

Example: I first quantified the project's goals, and then explained the equivalent effort that corresponds to each member of the personnel. This way, employees could fully understand what their personal goals where and how to reach them.

f.) Demonstrates commitment to sustainable engineering practices and the achievement of sustainable outcomes in all facets of engineering project work.

Example: I decided to use solar panels instead of petrol generators to power up the repeater substations, as their remote placement in the mountains favored the use of this kind of renewable energy resource, and lowered the maintenance and running cost by far.

Example: Instead of transporting the waste materials to a special treatment plant and paying for the services to two contractors, I proposed the development and implementation of an in-house waste treatment unit with enough capacity to service the needs of the plant for the next decade.

Section 3 – Professional and Personal Attributes

The third and final part of the Summary Statement concerns that applicant's personal traits, and main characteristics of the way the professional work is carried out. In this part, applicants exhibit their creative thinking, ethical conduct, collaboration with colleagues, document writing, time management, and team leadership. All these features are critical to the image of an engineer as they are an indispensable part of a successful professional.

Element 3.1: *"Ethical conduct and professional accountability"*

This part of the Summary Statement is mainly focused on the demonstration of the ethics, morals, and the deontology of the applicant. There are four indicators of attainment that can be used for the filling of this part of the document, namely:

a.) Demonstrates commitment to uphold the Engineers Australia – Code of Ethics, and established norms of professional conduct pertinent to the engineering discipline.

Example: Being an ethical professional, I respect my subordinates and assign them tasks in the context of developing an equal workload for all of them, and not based on racial, sexual, or any kind of mental discriminations.

Example: After the completion of the raising of the buildings complex, I organized a plantation session to restore the trees that had been removed from the area during the demolition stage. Moreover, I conducted recycling courses, and promoted a sustainable mentality to the new residents.

b.) Understands the need for 'due-diligence' in certification, compliance and risk management processes.

Example: I identified and characterized the risks in the implementation and operation of the toxic disposal plant, so I arranged for a meeting with consultants from the country's Environmental Protection Agency who advised me on the procedures, and authorized the construction according to the requirements.

Example: Before we initiated work on the site, I gathered all of the required licenses and permits from the construction department of the province. This ensured that the project would progress without unforeseen delays and/or fines.

c.) Understands the accountabilities of the professional engineer and the broader engineering team for the safety of other people and for protection of the environment.

Example: I ordered special nano-carbon filters that would filter the dangerous rhodium treatment gases as they left the post-heating chambers. This protected the workers from developing respiratory problems, and also protected the environment and air quality around the plant.

Example: The reproduction procedure of the local fauna was negatively affected by certain sound frequencies that were within the range of those produced by the electric power generators installed at the repeater sites. For this reason, I installed sound-insulating panels around the power units.

d.) Is aware of the fundamental principles of intellectual property rights and protection.

Example: I asked and was granted a user license for a patented technology based on stereolithography, which I needed to utilize in order to achieve rapid prototyping. I also cited the author of the owner of this patent in my final technical report.

Element 3.2: *"Effective oral and written communication in professional and lay domains."*

Communicating with supervisors, colleagues, and subordinates, is a crucial part of the skill set of every professional, and it is especially important for engineers who want to coordinate actions and collaborate on complex technical issues. This is what the second element of competency of the "Professional and Personal Attributes" table is in regards to. In this part of the Summary Statement, applicants have to fill in examples that highlight their communication and information-sharing skills.

a.) Is proficient in listening, speaking, reading and writing English.

Example: I gathered all senior engineers and technicians on site to attend a brainstorming session in English, and in the hope that this procedure would yield various solution ideas to the stuck pipe problem.

Example: I provided my instructions to the workers both orally during our daily morning meetings, and also posted them on the notice board in English for further reviewing by anyone interested.

Example: I have uploaded the in-depth technical report written in English, which explained in detail the procedure that I had developed and followed during the project to the company's online knowledge database.

Example: Because there were diverse international teams of engineers working on the site, I selected a head representative of each nation who could understand English terminology, to reproduce my instructions in the native language of each group.

b.) Prepares high quality engineering documents such as progress and project reports, reports of investigations and feasibility studies, proposals, specifications, design records, drawings, technical descriptions and presentations pertinent to the engineering discipline.

Example: Based on the notes that I was taking each day, I developed weekly progress and status reports which I shared with the management. Every month, I wrote another report that was more focused around resources used against the total project completion.

Example: I developed a Bill of Quantities document and sent it to the Procurement department of the company in order for them to check the parts list and cost, and grant the approval for the order placement.

Example: After the new debutanizer column system was successfully commissioned, I prepared the maintenance manual for the technicians, containing suggestions for the time intervals of check or replacement of each component, as well as precautions and instructions relating to the specifications of the parts.

Element 3.3: *"Creative, innovative and pro-active demeanor."*

This part of the SS requires that applicants showcase their ability to follow, develop, and apply creative approaches into their engineering work, choose innovative methods and/or solutions against more traditional and widely-applied options, and generally prove that they are aware of the latest developments in their field, and how to utilize spearhead knowledge to develop pioneering work.

a.) Applies creative approaches to identify and develop alternative concepts, solutions and procedures, appropriately challenges engineering practices from technical and non-technical viewpoints; identifies new technological opportunities.

Example: Attending a Festo seminar helped me realize that we could reduce the running costs of the production line by installing the new type of pneumatic elements that featured an automatic lubrication system, relieving from the need to employ large numbers of maintenance technicians.

Example: I solved the complete failure of a 20 years old processing and power unit of the remote control panel by innovatively incorporating an Arduino board with a Raspberry Pi computer, and a 15000 mAh power bank that powered the panel via USB.

b.) Seeks out new developments in the engineering discipline and specializations and applies fundamental knowledge and systematic processes to evaluate and report potential.

Example: I developed and presented a technical report that analyzed the long-term benefits that the workshop would have if the owner invested on the purchase of a new metal bar feeder that would be compatible with the existing CNC milling machines.

Example: Based on what I read on the "Modern Chemical Engineer" magazine, the distillation plant could incorporate a new type of crude oil pre-processing unit right on the existing infrastructure, potentially increasing the hourly yield production by up to 35%.

c.) Is aware of broader fields of science, engineering, technology and commerce for which new ideas and interfaces may be drawn and readily engages with professionals from these fields to exchange ideas.

Example: I contacted the foreman of a car manufacturing plant who used the same robotic arms as the ones available in my company, to discuss the ways I could adjust their configurable elements and render them suitable for the manufacturing of products of different size and specifications.

Example: I realized that the graphene sheets that a Taiwanese team of scientists suggested in the context of a new battery product development could also be used by my company for the manufacturing of strong yet lightweight composite materials. Thus, I contacted the head of their team to learn more about the application possibilities of this new material and reported my findings to my company's R&D department.

Element 3.4: *"Professional use and management of information."*

On this part, applicants will have to demonstrate their ability to locate and utilize information, critically assess the gathered information, and establish information control procedures. This is another key part of the engineer's skills set, as comprehensive and reliable information leads to safe conclusions on technical matters, and allows for the planning of targeted actions with predictable outcomes.

a.) Is proficient in locating and utilising information – including accessing, systematically searching, analysing, evaluating and referencing relevant published works and data; is proficient in the use of indexes, bibliographic databases and other search facilities.

Example: During the preliminary study phase, I researched for relevant published papers and journals in jstor.org, scholar.google.com, and papers.ssrn.com. After pinpointing what I needed, I directly downloaded the freely available titles, and sent a copy request to the authors of what wasn't.

Example: I researched on the company's knowledge database to find user cases that were similar to the one I was facing. As the tagging system had only recently been established, I managed to locate what I was looking for by developing a PHP script that would filter HTML blocks and compare the content with keywords that I had previously designated.

b.) Critically assesses the accuracy, reliability and authenticity of information.

Example: Every information source that was brought to the first meeting by the team of the R&D engineers was assessed based on whether it was written before or after the December 2004 incident that fundamentally changed our understanding on earthquake scales and global planetary ground effects.

Example: My company was using the same platform to gather customer and service agents feedback. To decisively increase the reliability of the incoming data, I set a unique public key for each agent to authenticate themselves and securely connect to the platform through a secure socket layer.

c.) Is aware of common document identification, tracking and control procedures.

Example: I established an information control procedure according to which everything that was uploaded to the database should contain info about the author, publication date, and a picture of the front page of the book/report/paper. This way, everything could be checked and verified.

Example: I selected four employees who were experienced experts in their respective field. All related information should pass their assessment first, and then it would be submitted to the management for final evaluation and approval.

Element 3.5: *"Orderly management of self, and professional conduct."*

This part of the assessment requires the demonstration of the applicant's proclivity towards long-life learning, personal development, professional skillset enhancement, convergence with the latest developments and advancements, and ability to estimate the importance and value of participating to communities and seeking constant knowledge strengthening through them.

a.) Demonstrates commitment to critical self-review and performance evaluation against appropriate criteria as a primary means of tracking personal development needs and achievements.

Example: I compared the production processes that I developed with the performance of other major organizations in the same field, and drew safe conclusions about the task execution capabilities, and the effectiveness of the established procedures.

Example: I used the comprehensive data that I gathered by tracking my own work, and focused on incidents that increased the chances of accidents. Based on these findings, I enriched the company's safety training courses with two new chapters that would hopefully decrease the accident rates by far.

b.) Understands the importance of being a member of a professional and intellectual community, learning from its knowledge and standards, and contributing to their maintenance and advancement.

Example: Being a member of the American Society of Civil Engineers allowed me to be one of the very first professionals to get informed about the latest technological, practical, and theoretical advancements and developments in the field.

Example: I actively participated in the most populated online forums dedicated to the topics of Electrical and Electro-Mechanical Engineering. This helped me get advice from experienced experts, and also allowed me to share my own knowledge and experience with others.

c.) Demonstrates commitment to life-long learning and professional development.

Example: I am regularly reading online journals and publications circulated by the Institute of Electrical and Electronics Engineers such as the "Antennas and Propagations Magazine", "Communications Surveys and Tutorials", "Intelligent Systems", and the "Nanotechnology Magazine".

Example: While I was working in California, I regularly checked the seminars schedule of the Mechanical and Civil Engineering department of Caltech University, and attended most of them. This helped me stay up to date with the most recent discoveries and realizations in my field of profession.

d.) Manages times and processes effectively, prioritises competing demands to achieve personal, career and organisational goals and objectives.

Example: I prepared timelines for each task and set deadlines on the calendar which I shared online with all stakeholders. This helped me track the progress of each activity and intensify work where it was required.

Example: Based on the Pareto principle, I identified the 20% of the most productive members of my department, and adjusted the workflow priorities in a way that would utilize them at the maximum possible level.

e.) Thinks critically and applies an appropriate balance of logic and intellectual criteria to analysis, judgment and decision making.

Example: I established a decision making procedure that suggested the assignment of specialization flags in each topic, with each flag corresponding to a group of experts in a particular field who met and discussed on a solid basis.

Example: I helped the company executives in their decision making by providing insight through the establishment of performance indicators monitoring procedures, allowing them to identify inefficient sectors and to foresee problems from early on.

f.) Presents a professional image in all circumstances, including relations with clients, stakeholders, as well as with professional and technical colleagues across wide ranging disciplines.

Example: I met with the client on a weekly basis, presenting the progress of the work in a professional manner, showcasing data tables, timeline analytics, photographs of the site, and a selection of personnel report information.

Example: I set up a webserver where I uploaded all reports and engineering documents relating to the project. I gave access to all stakeholders on this platform, thus keeping them up to date in a modern and professional way.

Element 3.6: *"Effective team membership and team leadership"*

As it is obvious from the title itself, this part of the SS concerns the applicant's ability to work within the context of a team of professionals, guide and lead other engineers to
Add headings (Format > Paragraph styles) and they will appear in your table of contents.
success, win the trust of colleagues and subordinates through the demonstration of accountability and professionalism, and showcase the capacity to understand how collaborations in demanding environments are set to work.

a.) Understands the fundamentals of team dynamics and leadership.

Example: In order to maximize the team's efficiency, I made sure to increase the satisfaction rates of the employees by allowing them frequent breaks, and by establishing a bonus system based on the individual performance.

Example: I successfully led a team of Mechanical Engineers, providing technical guidance during our daily meetings, giving instructions on the equipment installation procedures, and ensuring safety at the workplace.

b.) Functions as an effective member or leader of diverse engineering teams, including those with multi-level, multi-disciplinary and multi-cultural dimensions.

Example: Being the head of the automated systems development department, I organized and attended meetings with the leader of the electrical and electronics design department, and the head of the manufacturing.

Example: Because there were diverse international teams of engineers working on the site, I selected a head representative of each nation who could understand English terminology, and could reproduce my instructions in the native language of each group of technicians.

c.) Earns the trust and confidence of colleagues through competent and timely completion of tasks.

Example: I utilized advanced project management techniques such as Gantt charts, workflow tables, and weekly progress reports, leading to the timely completion of all the subsequent tasks and scheduled activities.

Example: My immaculate planning and personal dedication to the project won me the respect of colleagues, managers, and subordinates alike.

d.) Recognises the value of alternative and diverse viewpoints, scholarly advice and the importance of professional networking.

Example: I organized a brainstorming session which was attended by experienced telecommunication engineers who provided their insight and possible explanations on the investigated problem.

Example: When the product development started, I established weekly meetings with the leaders of the electrical, mechanical, and automation engineers teams. This way, experts in each field had the chance

to explain the product intricacies relating to their field, and how the designs of the other parts would affect theirs.

e.) Confidently pursues and discerns expert assistance and professional advice.

Example: I communicated with an international team of experts working in the same organization as I was through Skype. This not only helped me to overcome problems, but also to prevent issues from arising.

Example: I frequently visited engineering forums and technical IRC channels asking for advice on the fields that were part of my work, but outside my expertise.

f.) Takes initiative and fulfills the leadership role whilst respecting the agreed roles of others.

Example: When the emergency shutdown occurred, I immediately assigned tasks to all technicians based on the roles that they fulfilled throughout their service in the company.

Example: I led a team of five chemical engineers to success, by organizing their testing sessions and providing the required equipment, procuring the consumables, and making safety gear available in the lab, as per the requirements.

Hope you found this guide useful!