IPENZ ENGINEERS NEW ZEALAND

KNOWLEDGE ASSESSMENT SELF REVIEW (FORM KA02)

Name of Applicant:	ABC	**Membership number or date of birth:**	ABC

Section One

Important Instructions and Guidance

Carefully read the following instructions and guidance. They are designed to assist you in providing in providing a portfolio of evidence that best demonstrates the comprehension and application of your engineering knowledge to Washington Accord equivalence.

Section One – Instructions and Guidance

- Familiarise yourself with the definition of '*complex engineering problems'* (Appendix One) as you are required to demonstrate you can apply your engineering knowledge to solve complex engineering problems.
- Identify the '*engineering discipline and field'* (Appendix Two) you will provide evidence of your comprehension and application of engineering knowledge in.
- The knowledge assessment is based on Washington Accord knowledge profile. This form is designed to capture information to assist the evaluation of your evidence

Section Two – Knowledge Profile

- As you do not have a formal engineering qualification that formally benchmarks to a Washington Accord accredited degree, it is essential that you demonstrate that you have acquired an equivalent level of knowledge.
- The Context and performance indicators provide guidance on the evidence to be provided
- Consider each element of the knowledge profile, including the context statements and performance indicators. Summarise key aspects of your knowledge under each element and how this has been developed through academic study, on-job learning and/or continuing professional development. It is important you use the performance indicators and complexity definitions to enable you to describe your knowledge and how it has been developed.
- When describing how your educational program contributed to your development, focus on the more advanced pieces of work you did, the knowledge you needed in order to perform that work, and the abilities you needed in order to apply your knowledge in an engineering context.
- The word document is formatted to allow you expand a text box if required.
- Write your material in the first-person using 'I' or 'me' instead of 'we' or 'us'. This makes it easy for the assessors to see what your personal contribution was.

Section Three – Evidence of Application of Knowledge

- Describe 3-4 engineering projects or activities (Work/Study Episodes) that you have been involved with, which demonstrate your ability to apply your engineering knowledge to solve complex engineering problems. Think of activities where you have had to apply a high level of engineering knowledge – such as some analysis that you have done, work you have done in scoping a problem and then developing a solution or design. What engineering models did you use? What assumptions were made in the development of the model and how did you test the model was relevant in the way you used it?
- For engineers with limited practical experience post-graduation, project work undertaken during your study is likely to be one of the best ways of illustrating the application of your knowledge. As well as projects conducted within university or college, you may be able to draw on any industry experience required as part of the educational program.
- You are required to include actual samples of your work – calculations, analyses or reports that you have personally undertaken - to substantiate your work/study episodes.
- Write your material in the first-person using 'I' or 'me' instead of 'we' or 'us. This makes it easy for the assessors to see what your personal contribution was.
- The word document is formatted to allow you expand a text box if required.

Section Four – Supplementary Evidence

- You are required to submit a certified copy of your academic transcript(s) (formal record of papers taken and grades received) if you have not submitted to IPENZ already.
- Summarise your work history but include a representative sample of specific engineering projects or activities that evidence the development or application of the knowledge profile.
- Rather than listing all your CPD activities, provide details of those activities that have extended your professional engineering knowledge in your discipline and field and have assisted you to develop the knowledge profile of a professional engineer. A summary of all relevant activities – including those going beyond the most recent 6 years - will assist knowledge assessors in assessing your engineering knowledge. Assessors will be looking for how any gap between your qualification and a Washington Accord qualification has been bridged by your CPD.
- The word document is formatted to allow you expand a text box if required.

Section Five – Payment

- The fee for a knowledge assessment is NZ$1,351.25 GST incl. Please complete your credit card details.
- Send all documentation to address advised

What happens next?

The knowledge assessor will review your portfolio of evidence to determine the need for further challenge tests. This will involve an interactive assessment, that you will need to make yourself available for, either via tele or video conference and may also involve a series of challenge tests that may include one or a combination of:

- an oral and/or written examination
- a work simulation
- a case study

Your knowledge assessor will be in touch with you to discuss the next steps.

SECTION TWO – KNOWLEDGE PROFILE

ELEMENT ONE **A systematic, theory-based understanding of the natural sciences applicable to your discipline (e.g. calculus-based physics)**	
Context All engineering fields are rooted in one or more of the natural sciences. In a broad context, natural science is separated into physical and biological sciences. Physical sciences include chemistry, calculus-based physics, astronomy, geology, geomorphology, and hydrology. Biological sciences involve living systems and include biology, physiology, microbiology, and ecology. Washington Accord graduates are expected to be able to apply this knowledge of the natural sciences to solve complex engineering problems in their discipline.	
Performance Indicators • Fundamental quantitative knowledge underpinning nature and its phenomena. • Knowledge of the physical world including physics, chemistry and other areas of physical or biological science relevant to your discipline • Knowledge of key concepts of the scientific method and other inquiry and problem-solving processes; • Application of knowledge from one or more of the natural sciences to the solution of complex engineering problems relevant to your discipline.	
Summarise your knowledge of the natural sciences relevant to your discipline and how it has been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate. I obtained my Full-Time Engineering degree from the Vivekanand Education Society's Institute of Technology (VESIT) affiliated to the University of Mumbai in the year 1996. Website:- https://ves.ac.in/vesit/about-us/ I would like to specifically mention here that, even though my Institute does not fall under the category of Washington Accord status (Tier-1) as per the National Board of Accreditation-India, it was and is considered one of the best Institute for Instrumentation Engineering Course under the University of Mumbai. India. The Course content and the rigour was same as some of the Tier-1 (WA) Institute today. I always had a passion to pursue degree in instrumentation engineering as it is multidisciplinary and deals with application of electrical engineering sciences in Mechanical, Chemical, Bio-Medical and Civil engineering. Instrumentation mostly deals with measurement and control of physical parameters like Pressure, Temperature, Flow, Level, Mass, Volume, Stress, Chemical composition etc. So detailed knowledge about fundamental sciences like Physics, Chemistry, Biology, Geology and Mathematics is very	**Provide annotations to your supplementary evidence (document and page number)** 1. Resume

essential.

I passed my Grade 10 + 2 with excellent marks in the year 1992, which enabled me admission in to one of the top three institutes in the City of Mumbai. Refer Annexure-1 for my Grade-10 and Annexure-2 for my Grade-12 marks which are testimony to my competence in the fundamental sciences which are must for Engineering degree and a successful career.

I would like to list below the courses taken by me during the 4 years degree Program. Refer Annexure-3 for my all semester Marksheets from Sem-1 through Sem-8.

First Year:-	
Sem-1: Applied Mathematics I Applied Physics-I Applied Chemistry-I Engineering Drawing-I Engineering Mechanics-I Communication Skill-I Computer Programing-I Basic Electrical and Electronics-I Basic Workshop-I	Sem-2: Applied Mathematics II Applied Physics-II Applied Chemistry-II Engineering Drawing-II Engineering Mechanics-II Communication Skill-II Computer Programing-II Basic Electrical and Electronics-II Basic Workshop-II
Second Year:-	
Sem-3: Applied Mathematics III Electronics materials and components Electronics Devices and Circuit-I Linear Circuit and Transmission Lines Electrical Technology and Instrumentation Thermodynamic Heat Transfer	Sem-4: Applied Mathematics IV Electronics Devices and Circuit-II Principles of Economics and Management Electronic Instruments Control Systems Work Shop Technology
Third Year	
Sem-5 Control Systems Linear and Digital Integrated Circuit and Application Transducers and Instrumentation	Sem-6 Microprocessor and application Control system Components Process Instrumentation I Modelling and Simulation

Digital Technique Computer Programming III	Analog-Digital Transmission Digital Signal Processing
Fourth Year	
Sem-7 Opto Electronics Techniques Electronic Instrumentation Unit Operation for Instrumentation Microprocessor and Application-II Process Instrumentation-II Project-I Syncro to Digital Convertors for Robotics Department(Synopsis)	Sem-8 Process Equipment Design Project Planning Estimation & Assessment Biomedical Instrumentation-I Biomedical Instrumentation-II Project-II Syncro to Digital Convertors for Robotics Department (Report)

ELEMENT TWO

Conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to your discipline

Context

Branches of mathematics applied in engineering include arithmetic, algebra, geometry, trigonometry, calculus, differential equations, numerical analysis, optimization, probability and statistics, simulation, and matrix theory. Engineers apply mathematics in a wide variety of functions typically carried out in engineering organisations such as planning, design, manufacturing, construction, operations, finance, budgeting, and accounting.

Washington Accord graduates are expected to be able to apply this mathematical knowledge to solve complex engineering problems in their discipline.

Performance Indicators

- Knowledge of mathematics, statistics and numerical methods that supports the development or application of models that replicate 'real world' behaviours
- An understanding of the assumptions behind theoretical models and their impacts in the development and use of those models
- Ability to organise and analyse a data set to determine its statistical variability;
- Knowledge of trigonometry, probability and statistics, differential and integral calculus, and multivariate calculus that supports the solving of complex engineering problems
- Ability to apply differential equations to characterize time-dependent physical processes

Summarise your mathematical knowledge relevant to your discipline and how it has been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate. I carried out the project during my professional experience and executed well gathering systems along with an Infield Satellite Station (ISS) for each of the two well blocks and the Central Processing Facility (CPF). The project also included a pipeline for oil export to the South Tank Farm at Ahmadi, a fuel gas import pipeline and a pipeline to import make-up/source water to the CPF. There were also three pipelines to deliver wastewater from the CPF to wastewater disposal wells. Trunk lines supply fuel gas and 80% steam to the well blocks from the CPF and carry produced liquids and casing gas to the CPF from the field. The oil export, Fuel gas, wastewater and make-up/source water pipelines are being controlled from a SCADA system. All Smart Buildings equipped with Building management systems. Furthermore, I was responsible for Review/Approval of EPC Contractor's deliverables, Scope Variation, attend Review meetings, Formal Communication with Company (KOC) and Contractor, Technical queries and Concession requests regarding Instrumentation and Telecom Scope of work. Other activities included Monitor and Control quality of deliverables, Attend Design and safety Reviews, HAZOP, FAT, SAT, Site queries, Precomm, commissioning and operation stabilization activities.	**Provide annotations to your supplementary evidence (document and page number)** 1. Resume

ELEMENT THREE **A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline**	
Context Engineering fundamentals provide the knowledge base for engineering specialisations and represent a systematic formulation of engineering concepts and principles based on mathematical and natural sciences to support applications. The core areas of engineering fundamentals knowledge include fluid mechanics, statics and dynamics, electric circuits, solid mechanics, thermodynamics, heat transfer, mass transfer, and properties of materials. Washington Accord graduates are expected to be able to apply this knowledge of engineering fundamentals to solve complex engineering problems.	
Performance Indicators • Ability to define key factual information in core areas of fundamental engineering knowledge relevant to your engineering discipline • Evidence of sufficient depth of knowledge of engineering fundamentals to demonstrate an ability to think rationally and independently within and outside a chosen field of specialisation • Evidence of sufficient breadth of knowledge of engineering concepts and principles to allow subsequent professional development across a broad spectrum of engineering • Ability to apply knowledge of engineering fundamentals to solve complex engineering problems relevant to your discipline	
Summarise your knowledge of the core engineering fundamentals (as listed above) and how they have been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate. I executed the project in which the scope of work included engineering, procurement, construction, pre-commissioning, commissioning, and start-up work on the Badra Oil Field development's central processing facility, which comprises three crude oil processing trains. The overall ICSS scope was around 4000 Hardwired I/Os and 12 Package interfaces. I executed the job which included extensive coordination between Client (GAZPROM), Vendor (ABB) and back office engineering, ensuring integrated project delivery. I was responsible for completeness of all the ICSS engineering documents required for FAT readiness. I carried out FAT activities which included Hardware checks, Graphic Checks, Functional checks, Application checks and IFAT for packages, enveloped within a tight schedule of one month period. I carried out participation in SIL and Alarm Rationalization Studies. Furthermore, I attended IFAT at Linz, Austria for Instrument Air Compressor. Attended FAT for Liquid Metering Skid and Analyzer package provided by Alderly. Also, I was involved in HVAC Control systems FAT.	**Provide annotations to your supplementary evidence (document and page number)** 1. Resume

ELEMENT FOUR

Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline

Context

In addition to a broad understanding of fundamental engineering principles, professional engineers are required to develop specialised engineering knowledge to support their practice. This may be aligned with traditionally defined fields of specialisation such as structural, industrial or geotechnical engineering; coherent combinations of such traditional areas; or more recently emerging fields such as software, biomedical or mechatronics engineering.

Advancing technological knowledge and complexity means that technical specialisation is increasingly necessary for an engineer to remain abreast of technological development throughout their career.

Washington Accord graduates are expected to be able to apply this engineering specialist knowledge to solve complex engineering problems.

Performance Indicators

- Evidence of sufficient depth of knowledge to support practice within one or more recognised field of engineering
- Evidence of a systematic understanding of the coherent body of knowledge related to a particular field of engineering; its underlying principles and concepts; its usage and applications; and analytical and problem solving techniques
- Ability to apply specialist engineering knowledge to solve complex engineering problems

Summarise your specialist engineering knowledge and how it has been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate. While working as Reliance Industries Ltd., Worked as Senior Manager, Instrumentation in Corporate Engineering Division, Reliance Industries Limited, Navi Mumbai. I worked on various in-house projects related to Petrochemical, Power, Petroleum, Retail outlets, Oil and Gas and Pipelines since 2000, in my capacity as Senior Instrument Design and Lead Engineer. Furthermore, I worked on Jamnagar Refinery Expansion Project. I was deputed to London, UK from Feb 2006 till end of 2007 for Basic and Detailed Design Engineering. Also, I was responsible for delivering PMC services on various projects.	**Provide annotations to your supplementary evidence (document and page number)** 1. Resume

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ELEMENT FIVE

Knowledge that supports engineering design.

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Context

The design process – the root of engineering – is the process of devising a system, component or process to meet desired needs. Engineering design is a systematic process that involves problem definition and scoping, research, analysis, option development and selection, modelling to predict future performance, detailed design and testing. Importantly, it also involves communication of the outcome in a way that enables the design solution to be realised.

Washington Accord graduates are expected to be able to apply this knowledge of the design process to solve complex engineering problems.

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Performance Indicators

- Ability to undertake research and analysis to support the design process
- Ability to investigate a situation or the behaviour of a system and identify relevant causes and effects
- Ability to develop from first principles and construct mathematical, physical and conceptual models of situations, systems and devices, with a clear understanding of the assumptions made in development of such models
- Application of technical knowledge, design methods and appropriate tools and resources to design components, systems or processes to meet specified criteria
- Ability to analyse the pros and cons of alternative design options to support the development of an optimised design alternative
- Ability to analyse the constructability or manufacturing feasibility of a project or product
- Experience of personally conducting a significant design exercise, providing evidence of the consideration of various realistic constraints, such as safety, reliability, ethics, economic factors, aesthetics and social impact.
- Ability to apply appropriate design methods in solving complex engineering problems

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Summarise your knowledge that supports engineering design relevant to your discipline and how it has been developed and applied through formal study, on-job learning and/or continuing professional development.

Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate.

During my engineering duties at FINOLEX Industries Ltd., I was responsible for carrying out PM jobs and preparing budget for the unit. Planning annual shutdown jobs.

I was totally responsible for carrying out Field Design Engineering, Procurement, Erection, Commissioning and startup of **SPVC capacity expansion project. I** worked on DCS Migration Project from Taylor Mod 300 DCS to Yokogawa Micro-XL. Furthermore, I worked on the Cryogenic jetty and storage facility comprising of cryogenic storage tanks for Ethylene and EDC storage and hands on experience on Yokogawa – Centum CS, Siemens PLC, Modicon U84 PLC.

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Provide annotations to your supplementary evidence (document and page number)

1. Resume

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ELEMENT SIX

Knowledge of engineering practice in the engineering discipline

Context

Engineers require knowledge of a broad range of tools and techniques relating to technical (measurement, modelling, drawing, design), business (financial management, project management) and interpersonal (communications, teamwork) aspects of modern engineering practice.

Washington Accord graduates are expected to be able to:

- Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations.
- Apply knowledge of management principles and economic decision making as part of the management of engineering projects
- Function effectively as an individual and as a member or leader in diverse teams
- Communicate effectively with both technical and non-technical audiences

Performance Indicators

Tools and technologies:

- Awareness of critical issues affecting current technical and professional practice
- Awareness of current tools of analysis, simulation, visualisation, synthesis and design, particularly computer-based models and packages, and competence in the use of a representative selection of these
- Appreciation of the accuracy and limitations of such tools and the assumptions inherent in their use
- Knowledge of materials and resources relevant to the discipline and their main properties and ability to select appropriate materials and techniques for particular objectives
- Knowledge of a wide range of laboratory procedures relevant to the discipline and a clear understanding of the principles and practices of laboratory safety
- knowledge of current types of systems, equipment, information technology, and specifications that accomplish specific design objectives

Communication:

- write correspondence that clearly and concisely communicates facts and circumstances related to a project, product or process
- plan, prepare and deliver an oral presentation, with appropriate visual aids and other supporting materials
- communicate effectively with both technical and non-technical individuals and audiences

Engineering management principles and economic decision making:

- apply appropriate tools and techniques to monitor project schedules and costs

Team work:

- Operate as an effective team member or leader of a multidisciplinary team

ELEMENT SIX **Knowledge of engineering practice in the engineering discipline**	
Summarise your knowledge in each of these core areas underpinning engineering practice and how it was developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate. While working as Senior Design Engineer at PETROFAC International Ltd., Lump Sum Turnkey (LSTK) Engineering, Procurement, Construction and Commissioning (EPCC) works for installation of the islands surface facilities for the Production Build-Up (PBU) Phase that will achieve target oil production of 750,000 BOPD. The project included implementation of modularization strategy to maximize the scope of work performed in fabrication yards and minimize the work on the islands. The work iwas spread over on the four artificial islands which are approximately 80 kms in the sea from Abu Dhabi. Project comprises of the following major facilities: • **Well heads** • **Gas Lift Manifolds** • **Gas Injection Manifolds** • **Water Injection Manifolds** • **Produced Water Treatment** I was responsible for review of Engineering deliverables from Back Office in Chennai, Interaction with Client and PMC for comment resolutions on Basic and detailed Engineering documents, Model Review activities and handling interface issues with other EPC contractors.	**Provide annotations to your supplementary evidence (document and page number)** **1. Resume**

ELEMENT SEVEN **Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability**
Context Engineers design artefacts (facilities, structures, systems, products and processes) that are intended to meet a societal need, but which typically impact on individuals or groups in different ways. As a result, design and decision making processes must take account of often conflicting stakeholder needs. An understanding of this societal context and the ethical obligations that the engineer has in service of society are critical components of engineering practice. Washington Accord graduates are expected to be able to: • Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice • Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts.
Performance Indicators • Demonstration of ethical behaviour in accordance with ethical codes of conduct and established norms of professional conduct • Evidence of making ethical decisions and regulating one's own professional conduct in accordance with a relevant code of ethical conduct • Implementation of appropriate health and safety practices • Application of safe practices in laboratory, test and experimental procedures • Awareness of the social and environmental effects of their engineering activities • Awareness of sustainable technologies and sustainable development methodologies • Ability to identify risks as a consequence of engineering compromises made as a result of project or business constraints, and understanding of techniques to mitigate, eliminate or minimise risk • Knowledge of appropriate risk management techniques used to assess the accuracy, reliability and authenticity of information • Understanding of the role of quality management systems tools and processes

Summarise your knowledge of the role of engineering in society and how it has been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate. One of the key influences in the engineering is shaping the society. As the member of society and being an engineer, my responsibility was not only to handle and work with machines but also executed the design and electronics work which has direct influence on the society. I utilized science and maths for providing inventions and innovation which shape the society along with improving the way of living and working. I as an Engineer was also responsible for various acts and obtained adequate opportunity for ensuring with the positive influence in	**Provide annotations to your supplementary evidence (document and page number)** **1.** Resume

society. I implemented my duties as the multifaceted engineering role in society and obtaining an insight into making difference and contributing to society being a professional engineer. I maintained an engineering conduct towards other engineers and maintained an essential part as the professional engineer. I also evaluated the educational purpose along with professional societies pay inadequate attention to the specified area. I also worked on the project in an ethical manner with preparing the code of conduct. I prepared the professional codes of conduct for laying out the road map of professional relationships. I worked on internalize the codes along with mapping the personal stake in the application as the codes development process. There was the professional code maintained with the static statements developed with others. I was professionally responsible with an integral engineering process obtained throughout various projects.	

ELEMENT EIGHT

Engagement with selected knowledge in the research literature of the discipline

Context

Research and broader lifelong learning capabilities are essential if the engineer is to remain up-to-date with rapidly evolving scientific knowledge, technology and engineering tools critical to engineering practice

Washington Accord graduates are expected to be able to use research-based knowledge and research methods as part of the investigation of complex problems in their discipline

Performance Indicators

- Advanced knowledge in at least one area within your discipline, to a level that engages with current developments in that area
- Understanding of how new developments relate to established theory and practice and to other disciplines with which they interact
- Describe advancements in engineering research and technology and science in a particular area of engineering practice;
- Review research articles pertaining to a project component typically encountered in a specific area of engineering design;
- Choose topics most appropriate for continuing education to increase depth of technical knowledge pertinent to the specific area of engineering practice
- Commitment to lifelong learning.

Summarise your research knowledge and how it has been developed through formal study, on-job learning and/or continuing professional development.	Provide annotations to your supplementary evidence (document and page number)
Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate. Throughout my professional experience, I managed to learn advanced engineering knowledge which had direct influence on the fundamental work principles. I researched on concepts which had direct influence on Instrumentation Engineering concepts. I evaluated the work factors and reviewed the research articles pertained to the project component specifically based on Instrumentation Engineering. More than 24 years of I&C Engineering and Design experience in Conceptual Engineering, Basic Engineering Design, FEED, Detail Engineering Design, PMC, PMT, Proposal Engineering, FAT-SAT of ICSS, Vendor Packages, Field execution of large Control System and Instrumentation projects. I performed role of Deputy HOD, Technical Authority, Lead I&C Design Engineer, Discipline I&C Design Engineer, and responsibilities include originator, checker and approver. Also, I performed role of Lead I&C Project Engineer/ PMC/PMT/Owner's Engineer to review & approve Contractor/Vendor drawings/documents including handling variations; provide site support and co-ordination.	1. Resume

Section Three - Evidence of Application of Knowledge

In this section you are required to provide evidence of the application of your engineering knowledge using 3-4 engineering projects or activities (Work/Study Episodes) that you have been involved with.

Provide a general overview of the scope or parameters of each project or activity, your role in it and the particular challenges or complexities involved. Then describe, in narrative form, how it provides evidence of the application of different aspects of your engineering knowledge. Cross reference to the relevant elements of the knowledge profile in the right hand column.

You are also required to complete the Knowledge Matrix to summarise the contribution to knowledge demonstration made by each project. The work/study episodes are expected to provide at least 2 examples of the application of each knowledge element.

Work/Study Episode 1	**Element**
Overview of the project: The project which I did was "Lower Fars Heavy Oil Project (LFHO)" at Worley. The detailed engineering for this project started in the Year 2015 and continued till 2019. 2019 through 2020 is the commissioning, startup, ramp-up period of the project. I was asked to join this project from August-2017, as Lead Design Engineer-1. The purpose of the project was the the Lower Fars Heavy Oil development is targeted at a large heavy oil accumulation of approximately 7 to 15 billion barrels of oil located in a desert area of some 1200 square kilometres in northern Kuwait. The area will be developed in phases with this project being phase 1. The project involves wells, well gathering systems, an Infield Satellite Station (ISS) for each well block and the Central Processing Facility (CPF). Phase-1 includes two operating trains in the CPF. Phase 1 includes 2 well blocks with a production capacity of 60,000 bopd. The control system was able to expand to accommodate all phases of development at Lower Fars. Phase 1 of the development is intended to be a standard design that will be applied to future phases. Phase 1 will also include a pipeline for oil export to the South Tank Farm at Ahmadi, a fuel gas pipeline to import fuel gas from Kadma and a pipeline to import make-up/source water to the CPF from Sulaibiya. There was also be three pipelines to deliver waste water from the CPF to 13 waste water disposal wells. Trunklines will supply fuel gas and 80% steam to the well blocks from the CPF and carry produced liquids to the CPF from the field. The fuel gas trunkline will be bidirectional and will transport casing gas from the wells to the CPF when there is an excess. The project also included expanded facilities and upgrades at the South Tank Farm (STF) and Crude Oil Control Centre (COCC) in Ahmadi. **Your role and responsibilities** I was responsible for review/approval of EPC Contractor's deliverables, Scope Variation, attend Review meetings, Formal Communication with Company (KOC) and Contractor, Technical queries and Concession requests regarding Instrumentation and Telecom Scope of work. Other activities include Monitor and Control quality of deliverables, Attend Design and safety Reviews, HAZOP, FAT, SAT, Site queries, Precomm, commissioning and operation stabilization activities. Earlier I started with looking at the Design review of CPF, Pipelines and STF facilities. I was one of the 6 Instrumentation engineers working on this project during the peak time. Subsequently with the decrease in review activities, today we are two engineers handling the Instrumentation Scope of work. Since last 2 years, I have been the technical authority for the entire Instrumentation scope of work for the project, which is highly responsible job. **Complexities (using the complexity definitions) and challenges of the project** **(i) Problem define:** Frequent Tripping of Instrument Air (IA) Compressors (Total 9 Nos) due to incorrect selection of inter-posing relays for the SIL PLC Digital output cards. **Effect of problem:** During the commissioning of the IA Compressors it was noticed that the IA Compressors tripped more frequently there by affecting the stability of Instrument Air for the Plant, which is very crucial in a Hydro carbon plant. Instrument air is used as motive power for driving various control and on-off valves in the plant. IA is also used for purging of certain instruments. **Root Cause of Problem:** During the investigation it was noticed that electrical breaker tripped abruptly without any process interlock. On further investigation it was found that it tripped due to tripping of Interposing (IRP) relays which were being driven by Siemens PLC I/O card. These I/O cards were SIL (to be used for safety application) rated and so were the IRP relays. It was further noticed that the PLC controller for diagnostics of the I/O card, send a few milli seconds dark cycle (drop in the voltage),	**Two** **Four**

which sometimes affected the voltage sensitive relays. As a solution I suggested to select the relays which are not sensitive to few milliseconds drop in the voltage which is inevitable due to inherent diagnostics mechanism of the Siemens PLC. The PLC integrator had not considered the design recommendations in the PLC Manual. Moreover the incompatibility of the relays was not a known thing in the technical literature. The system integrator was also not aware of the dark cycle scan of the PLC I/O for the I/O diagnostics.

Six

Final Solution: As a final solution all the interposing relays were changed with a new model number which were compatible with the Siemens PLC DO cards. The compressors stopped tripping then after.

(ii) Problem define: Failure of RS-485 Modbus Communication between Honeywell Supplied Terminal Servers and Sucker Rod Pump Controllers, due to unknown reasons. There are total of 120 such serial communication links of which around 30 nos failed due to unknown reasons in Well Block-2 and Well Block-3. In few cases the Honeywell supplied Terminal Servers failed. In few cases the SRP controllers failed.

Effect of problem: On each communication link there are 5 digital signals: Available, Running Stopped, Remote, Fault, and Emergency Stop status, which were unavailable for the operator in the Control Room.

Two

Root Cause of Problem: The Terminal Servers and SRP Controllers were sent to respective suppliers for identifying the root cause. It was diagnosed that the hardware probably failed due to very high voltage surges from the RS-485 communication Links. Two communication circuits were initially observed for 15 days and the voltages were noted on the communication lines. The communication was found steady and healthy during the observation period. It was also noticed that during the failure of the communication there was heavy thunderstorm in that area. Due to open area, it was likely that heavy lightning strikes could have caused surge currents to flow in the RS-485 communication circuits thereby affecting the electronic equipment.

Final Solution: Other causes of surge currents like improper earthing or ground loops were ruled out, as the earthing system avoided formation of any ground loops which are major causes of surge currents and voltages for copper communication lines. In my personal capacity I had predicted that lightening in the area, could be the main reason behind the failure of the hardware, which was confirmed by the suppliers after their diagnosis. The System vendor proposed to introduce surge protection devices at the terminal servers end as well as the SRP controllers at the well heads.

(iii) Problem define: This wasn't a problem really but understanding the working of steam analyzers installed in steaming manifold before it gets injected into the heavy oil well for heating purpose. The quality of steam is particularly important from the point of view of yield from the oil wells. Better the steam quality better is the yield from the well. The issue here was that the steam analyser reading was varying and it was known the phenomenon due to which there was variation. This was delaying the steaming activity of the wells. I was part of the team, on whom the onus was to facilitate the "go ahead" decision for steaming for the first oil well identified for steaming.

Effect of problem: The steam analyser at the well pattern manifold area, showed variation and this was delaying the decision to go for steaming. The exact physical phenomenon for this variation was not known and hence we had asked for expertise from the supplier for commissioning of this analyzer. The expert from the Vendor explained the phenomenon of variation in steam quality which is expressed in percentage term as (mass of steam / (mass of steam + mass of moisture in the steam) x 100.

Root Cause of Problem: I purchased following papers from "Society of Petroleum Engineers" of which I am a member, to understand the phenomenon behind the variation of steam quality.

- SPE-1941-PA, "Determination of Steam Quality sing an orifice Meter"
- SPE-13634-MS, "Steam Quality measurement in flow lines".

The steam quality analyzer works on the principle of measuring the steam quality as function of the pressure drop across the orifice plate installed in the pipe media for steam flow.
Final Solution: It is evident from both the papers that the steam analyzer readings will vary according to

changes in the flow map, which is also due to the piping geometry between the steam generator and the oil well to be injected in the steam. What is important is the average steam quality which should be stable and not the instantaneous value. We had readings from both the online steam analyzer (See attachment-3 for sample reading) and the portable steam analyser, which showed stability in the average value, which was very important for us to decide the "go ahead" for steaming activity for the first well and also the subsequent wells to be injected. **How does this project demonstrate application of your engineering knowledge?** There was the typical design problem which I came across. During the detailed engineering phase of the project, some of the design conditions changed way after things were already procured and delivered at site. There are total of 510 wells, each with steam injection facility and also production facility. To measure the amount of steam flow, there is vortex type flow meter which is used to control flow through a flow control Valve. Appended with this description, is the brief control narrative and the P&ID related to this issue. Due to change in the design conditions the stem flow velocity during injection phase got reduced below the measuring threshold of the vortex flow meter. Now the challenge was to estimate the steam injection flow rate based on the other available process parameters. Myself and my colleague, a process engineering which we jointly started working on the issue. I gathered all the data from the Control room for some sample wells, wherein the flowmeters was showing some data, though not accurate. We had data from the steam quality analyser, which was installed at the steam distribution manifiold. Based on the Valve sizing data available from the vendor, we could estimate the steam flow rate through the control valve which matched closely with the flowrate measured by the vortex flow meter. I used the two-phase flow sizing equation for the Control valve to estimate the flowrate for a typical percentage opening of the valve. The operators also used the equations to calculate the valve percentage opening required to obtain a desired flow rate. Even to date the plant operation Contractor use the same flow equations derived by us to estimate the steam injection flow rate, in absence of a credible flow measuring instrument. There were various technical skills which I learnt as an Instrumentation Engineer for obtaining the desired work results.	
Work/Study Episode 2 **Overview of the project:** Early Power Plant Project at Rumaila Oil Field by M/s BP and M/s CPECC. I worked with Ch2mhill from Jan-2014 till July-2016. This Company was taken over my Jacobs in Dec 2017 and was part of Jacobs ECR Business. Later in the year 2019, Jacobs ECR Business was acquired by Worley Parsons. The combined business is now called Worley. The Contract awarded for this project was for FEED verification plus Detailed Engineering. The FEED verification engineering for this project started in Feb-2014 and followed by Detailed Engineering starting from Jan-2015. The detailed engineering and procurement phase continued till August-2017. I worked as Lead Design Engineer-Instrumentation on the Project. The Early Power Plant Project is an early part of the overall power generation for the Rumaila Oil Field in Southern Iraq. It incorporated a standalone simple cycle power generation facility of 150 MW Capacity, using 6 nos Heavy Industrial type Gas Turbines (GT), each with 30 MW capacity, with fuel gas, being piped in from the local degassing stations. The project also involved Degassing separator controls, Pipeline Leak detection and Pipeline Integrity Management System, including SCADA system for the pipeline. The purpose of Early power plant is to power up Field development activities in Iraq for further oil exploration and also serving the local communities in terms of power availability. Our Company was responsible for Concept Engineering, FEED, Detailed Engineering, Brown Field Engineering including site visits and support.	**Element** **Two**

Your role and responsibilities

I was Lead Engineer Instrumentation for this project starting from Feb-2014 till July-2017. I was Leading a Team of Instrumentation Engineers in UAE and India to deliver on the project. I also visited Degassing stations in Iraq, for tie-in Survey and meeting with Client Operations team.

Some of the responsibilities/ duties/ tasks that I performed in this project are as below: - **Four**

- I did the preparation of important engineering design deliverables such as design basis, philosophies, calculations, specifications & data sheets for various systems & field instruments/valves,
- I carried out checking, verification of Material Take Offs, design drawings required for Construction & Commissioning.
- I worked on checking, verification of engineering and design deliverables for Integrated Control and Safety systems, custody transfer metering, analyzers and machine condition monitoring.
- I coordinated for telecommunication scope of work such as PAGA/PABX/CCTV/access control/building management system, wireless communication, telecom transmission equipment and fiber optic system including associated block diagrams, layouts, wiring drawing.
- I did the preparation/Checking of material requisition, technical bid analysis & recommendation.
- I reviewed of Vendor drawings/document & approval, inspection & expediting including Factory Acceptance Tests for various Instruments and systems.
- I made co-ordination and interface with other disciplines, project monitoring, man-hour and cost estimates.
- I participated in SIL, HAZOP, 3D Modelling, design reviews HAZID and various other technical workshops.
- I followed Engineering Codes, Standards and certifications of products: - API, ISA, ASME, NACE, NFPA, IEC, ISO, IEEE, ASTM, BIS, NORSOK, Shell DEPS, SIL, CENELEC, FM, ATEX, UL.
- I worked on setting up of Project automation tools such as SPI and various Instrument sizing calculators.

Complexities (using the complexity definitions) and challenges of the project

There was technical difficulty faced regarding the development of Architecture Drawing for the Integrated Control and Safety Systems. (Ref:- Attachment-B)

This activity was supervised by me for development of Architecture Drawing for the Integrated Control and Safety Systems. **Six**

The main objective of this drawing was to show various components of the Control and safety Systems and the various interface with other third-party systems. The integration of the system was brought about by the Telecom network which functions as back bone for the Control and safety network of the plant. The Process Control Philosophy document, which was prepared by me is the basic guide for development of this document. The Architecture drawing clearly shows the various process areas and the systems to which these process areas are connected. E.g. There were three dominant process areas: a) Gas Turbine Area b) Fuel Gas Compressor Area c) Balance of Plant with utilities and pipelines as depicted in the drgs.

This Architecture drg is mainly used for Invitation to bids from various Control systems vendors. It is the basic document along with Other documents like Input / Output Summary, Control Philosophy and Instrumentation Design basis which together forms a basis for the vendors to quote for their system scope of work and services. **Three**

How does this project demonstrate application of your engineering knowledge?

I worked on different Instrumentation Engineering tasks when executing the project activities and some of them are listed below:

Writing Control Narrative for the DCS

I undertook this activity of writing the Control Narrative for the programming of the Distributed Control

System. A Control Narrative complements the Piping and Instrumentation Diagrams which are design documents produced by the Process discipline defining various equipment and instrumentation and piping. The outline of the Control loops are defined on the P&ID except the detailed narrative which is covered under a separate “Control Narrative “document.
The Control Narrative was a bridging design document that provided the logic description and also provided the interface narrative for interfacing the logic of various packaged equipment Programmable logic Controllers (PLCs).
Attachment-A is the detailed Control Narrative that was being developed with the Process team working on this project. I was also assisted by my colleague for collecting the required data from various package equipment supplier.
The step by step procedure which was being followed for developing a Control Narrative was as followed:

1. The first step was to collect all the Process P&IDs on the project along with the detailed Vendor Package P&IDs.

2. List all the Control Loops.

3. Segregate the control Loops in to Simple, Cascade and Complex Loops.

    a. Most simple loops fall under On/Off, Gap Control and Proportional, Integral, Derivative (PID) category.

    b. The cascade Loops were with dual parameter control like pressure loop controlling a primary flow control loop.

    c. The Complex Loops were multivariable Control like the Compressor surge Control or the GTG fuel firing Controls etc.

4. Last important steps was to identify various miscellaneous task and controls that were to be performed by DCS. The most miscellaneous tasks were alarms, trips, sequencing, compensation formulas execution etc.

5. Validated and finalized the Control Narrative with the Process Engineer for final issue.

Four

Many aids were required to develop an efficient and effective Control narrative that covered all the scenarios ensuring smooth running of plant and for safe operation. For developing control Narrative, one must be thorough with Physics, Chemistry and Mathematics to understand various process phenomenon and control scenarios. Defining the Control objective in a lucid uncomplicated style is particularly important, for ease of implementation by the DCS Programmer.

Instrumentation and Control Philosophy

This step was based on defining the instrumentation and control philosophy for the Early Power plant (EPP) for the Rumaila Oil Field.
The work was done for control systems that were to be provided for the control, monitoring and the safeguarding of the equipment that form part of the balance of Plant (Fuel gas conditioning and Utilities plants) and relevant interfaces to the Power Plant (Gas Turbine Generators), Fuel Gas pipelines and Power Management Systems (PMS).The basic philosophy relating to the field instruments, Plant Interface Buildings, Central Control Room is also covered.
For development of this document, the primary input is the Process Design Philosophy and the Project Design Basis document. These input documents helps understand various plant areas and their Interfaces with each other for running of the overall Plant.
The major Control systems identified for this projects were as below:-

Six

- Balance of Plant Integrated Control and Safety Systems

- Pipeline Integrity Monitoring System (PIMS) and Pipeline Controls

- ESD system Requirement for Degassing Station-1 and Degassing Station-3

- Control Requirements for DS-1 and DS-3

- Gas Turbine Generators
- Power Management System
- Power Distribution Control System (PDCS)
- Fuel Gas Compressor Controls
- Gas Metering System
- Telecom System Interface

Technical Bid Analysis for ICSS Systems

Technical Bid Analysis was done for every item which was procured by bidding process. For ICSS system, there were 4 different vendors (ABB, Honeywell, Rockwell and Emerson) quoted for the system. The challenge was to compare all the Vendor by following the steps below and then shortlisting the best of the bidders on technical grounds for the final commercial closure of the bidding process.

- Listing all the Technical and Commercial parameters for comparing the Vendors as against fulfilment of project specifications.
- Populating the description as provided by each Vendor for various parameters.
- Listing Compliance or Non-Compliance or additional data required for each parameter.
- Producing Technical queries-1 round for each of the Vendors.
- After obtaining the answers from various vendors populate the incomplete fields. The answers for various Technical queries can be obtained by either by conference calls or by meetings in person.
- Producing Technical queries-2 if required.
- Listing the exception and deviations from Vendors. Non-acceptable deviations disqualify the Vendor.
- The various keys which were used for TBE were as below which facilities in shortlisting the vendor.

Once up to 3 vendors were technically qualified based on the analysis, these vendors were called for technical and commercial discussions for final closure of the order.

Work/Study Episode 3

Element

Overview of the project: FEED for QG1 Waste Heat Recovery Project

I joined Worley Parsons, Qatar in Feb-2017. Later in the year 2019, Jacobs ECR Business was acquired by Worley Parsons. The combined business is now called Worley. The Project was kicked off on March-2016 and Closed out in July-2017. I joined this project in Feb-2017, as replacement for another Lead Engineer working on this project, who resigned from the organization during the same time.

Two

WorleyParsons was awarded the Contract by Qatar Gas for "FEED for QG1 Waste Heat Recovery Project" with the scope summarized, but not limited to, as below:

- Verification of Pre-FEED Feasibility Study;
- FEED for Conversion of simple cycle Gas Turbine Generators (GTGs) into a combined and cogeneration plant complete with auxiliary equipment;
- Detail engineering for tie-ins (Piping, Electrical and Instrumentation);
- Identification of long lead items and performing Deep FEED;
- EPCC Cost Estimate;
- EPCC Schedule;
- EPCC SOW; and
- EPCC Tender Package and LLI Tender Package.

The purpose of the Project was to "Recover Waste Heat, to optimize Fuel utilization efficiency there by reducing Greenhouse Emissions (CO2 & NOx), to meet additional Power Demand, with minimal CAPEX, by maintaining/improving current system reliability".

Your role and responsibilities

Four

I was Lead Engineer Instrumentation for this project starting from Feb-2017 till July-2017. I was Leading a Team of Instrumentation Engineers at Doha, Qatar to deliver on the project.

Some of the responsibilities/ duties/ tasks that I performed in this project are as below: -

- Preparation of important engineering design deliverables such as design basis, philosophies, calculations, specifications, Amendments & data sheets for various systems & field instruments/valves,
- Checking, verification of Material Take Offs, Specifications, Amendments, Tie-ins, Philosophies, design drawings required for Construction & Commissioning.
- Preparation/Checking of material requisition, technical bid analysis & recommendation for costing of major field Instruments and systems.
- Co-ordination and interface with other disciplines, project monitoring, man-hour and cost estimates.
- Participation in SIL, HAZOP, 3D Modelling, Design reviews HAZID and various other technical workshops.
- Site Visit for brown field work and Tie-ins. Prepare Tie-In schedule for Instrumentation scope of work and also prepare detailed Tie-in Interface Agreement for each Tie-in.
- Followed Engineering Codes, Standards and certifications of products: - API, ISA, ASME, NACE, NFPA, IEC, ISO, IEEE, ASTM, Shell DEPS, SIL, CENELEC, FM, ATEX, UL etc.
- Mentored the Young Engineers and Train them.

Complexities (using the complexity definitions) and challenges of the project

I was responsible for either preparation or act as a checker for various revisions of following major project documents. Legend: - C: - Role as a Checker; O: Role as Originator; B1, B2, B3, C1, C2 are revision nos. • Instrumentation and Control General Philosophy B3: C, C1: O • Instrumentation and Control Design Basis C1: C, C2:O • Amendment to DCS Requirements B2: O, C1: O • Amendment to Technical Specification Machine Monitoring System: B3: C, C1:O, C2:O A1) The instrumentation and control philosophy document describe the major control systems that are to be provided for the control, monitoring and the safeguarding of the equipment that form part of the overall plant. The basic philosophy relating to the field instruments, Instrument Technical Room, Main Control Room is also covered. A2) The Instrumentation and Control Design basis defines the design criteria which shall be followed to implement the Instrumentation and Control design of various facilities during the FEED for QG1 Waste Heat Recovery Project. It is considered as an approved source of input data for the engineering team. It provides the technical basis and guidelines required to carry out the FEED. A3) The Amendment to DCS Requirement specification defines the minimum requirements for the design, fabrication, testing, and preparation for shipment of the Distribution Control System (DCS). A4) Amendment to Technical Specification Machine Monitoring System covers the scope work for supply of a Machine Monitoring System (MMS) for the WHR project consisting of: • Steam Turbine Generator • HPFG Compressor • VHP Boiler Feed Water Pumps • Fin Fan Cooler • Polisher Feed Pumps • Cooling Polished Condensate Pumps • Polished Condensate Pump. The Amendments specifications were produced to amend the Older specifications of the Company and adapt them for FEED and detailed engineering work. Some of the outdated and non-applicable clauses were removed or modified in the Amendment revisions. The procedure to revise any document was by addressing all the comments of the Client through Client Comments Resolution Sheets (CRS). Client can either accept or provide further comments on the resolution offered by the engineering Contractor. To minimize the work, it was most practical to have a pre-approval of the CRS through meetings or emails and then issue the revised document along with the CRS for final approval. **How does this project demonstrate application of your engineering knowledge?** **Writing Control Narrative for the DCS** I was involved in drafting of Revision B2, B3 of this document and also checker for the Rev C1 for its approval. A Control Narrative complements the Piping and Instrumentation Diagrams which are design documents produced by the Process discipline defining various equipment and instrumentation and piping. The outline of the Control loops are defined on the P&ID except the detailed narrative which is covered under a separate “Control Narrative “document. The Control Narrative was a bridging design document that provided the logic description and also provided the interface narrative for interfacing the logic of various packaged equipment Programmable logic Controllers (PLCs).	**Three** **Four** **Six**

Attachment-B is the detailed Control Narrative that was being developed with the Process team working on this project. I was also assisted by my colleagues for providing the required data from various package equipment supplier as well as other disciplines like electrical and Mechanical.
The step by step procedure which is being followed for developing a Control Narrative is as follows:-

1. The first step was to collect all the Process P&IDs on the project along with the detailed Vendor Package P&IDs and list all the Control Loops.

2. Segregate the control Loops in to Simple, Cascade and Complex Loops.

    a. Most simple loops fall under On/Off, Gap Control and Proportional, Integral, Derivative (PID) category.

    b. The cascade Loops are with dual parameter control like pressure loop controlling a primary flow control loop.

    c. The Complex Loops are multivariable Control like the Compressor surge control and the HRSG Controls and the Steam Turbine Controls etc.

3. Last important steps is to identify various miscellaneous task and controls that are to be performed by DCS. The most miscellaneous tasks are alarms, trips, sequencing, compensation formulas execution etc. Validating and finalizing the Control Narrative with the Process Engineer for final issue.

Many aids were required to develop an efficient and effective Control narrative that covers all the scenarios ensuring smooth running of plant and for safe operation.
For developing control Narrative, one must be thorough with Physics, Chemistry and Mathematics to understand various process phenomenon and control scenarios. Defining the Control objective in a lucid uncomplicated style is particularly important, for ease of implementation by the DCS Programmer.

Preparation of detailed Instrumentation Tie-in List with existing facilities
Preparation of detailed Instrumentation Tie-in List was the most important task on the project, involving site visits, meeting site O&M personnel and also identifying existing availability of spare space and components.
There were total of 28 Tie-ins identified on this project during the FEED stage for various interface areas as below:-

- Power Control Centre (PCC) Console space
- Existing Instrument Cable trenches
- Distributed Control System (DCS) System
- Plant Operation Interface System (POIS) system
- Alarm Management System (AMS) Server
- NTP Server
- Net-sight (Network Management Interface)
- F&G System
- Main Control Room (MCR) Utility Console
- Instrument Technical Room (ITR)-10 Annunciator Panel
- ITR-4 Console/Mimic panel
- ITR-4 ESD System
- PCC Fire Alarm Panel

Three

• System-1 Server • GTG Mark VI system • CEMS I prepared the document which further helped in generating detailed interface agreement documents for each of the interface mentioned above. This document helped the bidder while estimating the scope of brownfield work, which was much costlier than work in the green field areas.	
Work/Study Episode 4 **Overview of the project:** Iraq based Badra Oil Field development project by M/s GAZPROM. Earlier I was leading the bidding process for Instrumentation scope of work. The Bidding process started in July 2011 and ended in Aug 2011. The Contract awarded for this project was for Detailed Engineering. Detailed Engineering phase started in May-2012 and continued till August-2013. The scope of work included engineering, procurement, construction, pre-commissioning, commissioning, and start-up work on the Badra Oil Field development's central processing facility, which comprised three crude oil processing trains. The overall ICSS scope was around 4000 Hardwired I/Os and 12 Package interfaces. **Your role and responsibilities:** I worked on as Lead Engineer in the project. Earlier, I was leading the bidding process for Instrumentation scope of work. The job involved accurate estimation of the Bill of material for Instrumentation scope of work and also costing for all the items based on internal cost or inviting bids from Vendors. I also estimated the costing of construction/commissioning services and total Man hours costing for the Instrumentation scope. I also worked as Lead Engineer; ICSS (DCS, ESD, and FGS) for this project starting from Aug-2012 till Aug-2013. I led a Team of Instrumentation Engineers in UAE and India to deliver on the project. Some of the responsibilities/ duties/ tasks that I performed in this project were as below: • I made extensive coordination between Client (GAZPROM), Vendor (ABB) and back office engineering, ensuring integrated project delivery. • I was responsible for completeness of all the ICSS engineering documents required for FAT readiness. • I carried out FAT activities which included Hardware checks, Graphic Checks, Functional checks, Application checks and IFAT for packages, enveloped within a tight schedule of one-month period. • I obtained participation in SIL and Alarm Rationalization Studies. Attended IFAT at Linz, Austria for Instrument Air Compressor. • I attended FAT for Liquid Metering Skid and Analyser package provided by Alderly. • Also, I was involved in HVAC Control systems FAT. **Complexities (using the complexity definitions) and challenges of the project** I faced the technical difficulty related to Proposal Engineering. I carried out the estimation of instrumentation scope of work for Bid Proposal. Estimating the Bill of Quantity for Procurement and Construction. Costing of the BOQ for procurement and Construction. Following sub-attachments have been provided under Attachment-A for illustration of work being carried out in this regard. A1 Cost Estimation base case back up A2 Cost Estimation Summary A3 Evidence of Contribution A4 Kick off Meeting Presentation for proposal A5 Evidence for Nomination	**Element** **Two** **Three** **Four**

A6 Contribution to Technical Bid Basis for Instrumentation The step by step procedure which is being followed for developing a Control Narrative is as follows: The first step was to read all the invitation to bid documents (ITB). The major documents to read for instrumentation were: Technical specifications, Standards and Philosophies, Process P&IDS, All the FEED Instrumentation deliverables. • I listed down all the Technical Queries for the client. • I listed down the assumptions for qualifications to be obtained from the Client. • I prepared the BOM based on the FEED P&IDs and Proposal Engineering inputs from other disciplines. This included preparation of layouts and modelling wherever required for verification of FEED. • I listed down all the deliverables required on the project. • I carried out estimation of the man hours required for Engineering. • I prepared Service order quantity (SOQ) for Construction scope of work. • Once all the BOQs, Deliverables and SOQ were sorted, the final task was to find the overall cost by plugging in the individual cost data based on internal pricing or obtaining bids from vendors for major procurement items. • I attended various rounds of discussion with clients and also internal coordination meetings. **<u>How does this project demonstrate application of your engineering knowledge?</u>** Witness of Factory Acceptance test on the Project for Integrated Control and Safety Systems (ICSS) scope of work at ABB Facility in Dubai. Following steps were followed for the Conduct of Factory Acceptance Test. • Kickoff Meeting for Conduct of FAT as per approved schedule and Plan. • Ensuring sufficient Manpower is available both from Client side and Vendor's side for successful completion of FAT program. • Verification of Bill of Material for each system and Marshalling Cabinets as per the approved GA Drawing and in fulfilment of the Contractual requirements like availability of spare components and space for future installation. • Powering up of the Cabinets and subsequent functionality checks of the various components. Typical Checks are redundancy Checks, I/O Loop Checks, Checking of Lighting, ventilation fans, thermostats within the cabinet. • Checking of all the Graphics as per the P&IDs and the requirements of Control narrative, Cause & Effect document and Interlock Schedule. • Checking of Network loading and redundancy. • Checking of third-party interface with Integrated Control and Security Systems. • Providing punch points for resolution by the Contractor. • Checking of Punch points resolution by the Contractor. • Preparation of FAT Close out report. • Verifying the Packing list for final dispatch of the complete systems from Vendor's shop floor.	**<u>Six</u>**

Knowledge Matrix

Knowledge Element	W/S Episode 1	W/S Episode 2	W/S Episode 3	W/S Episode 4
1. Application of knowledge from one or more of the natural sciences	1.8, 1.10	2.8, 2.10	3.8, 3.10	4.7, 4.9
2. Application of knowledge of mathematics	1.11, 1.12	2.6, 2.9	3.3, 3.7	4.8, 4.10
3. Application of knowledge of engineering fundamentals	1.7, 1.9	2.11, 2.12	3.4	4.6, 4.11
4. Application of specialist engineering knowledge to solve complex problems	1.12	2.7	3.6	4.12
5. Application of knowledge of design methods to solve complex problems	1.11, 1.13	2.13, 2.14	3.14	4.14
6. Application of knowledge of key elements of engineering practice	1.14	2.12	3.6, 3.7	4.6, 4.8
7. Role of Engineering in Society	1.8, 1.10	2.8, 2.13	3.8, 3.9	4.9, 4.10
8. Application of advanced knowledge in an area of your discipline	1.7, 1.9	2.14	3.12, 3.13	4.12

SECTION FOUR – SUPPLEMENTARY EVIDENCE

Academic Transcript(s)

Please attach a certified copy of your academic transcript(s) if you have not already supplied one to IPENZ

WORK HISTORY SUMMARY

List your employment history starting from your most recent employment and then chronologically back to the start of your first job.

Ref No	Name of Employing Organisation	Position Title	End mm/yy Start mm/yy	Key responsibilities, activities undertaken, major achievements and/or projects. These should relate to your practice area description.
1.	**Worley Parsons, Doha, Qatar and Kuwait.**	Principal Instrumentation Engineer	Present Start at: February 2017	• Working as PMC Lead Design Engineer-I on KOC Heavy Oil project, based in Ahmadi-Kuwait since Aug-2017. Project Value: - 4 Billion Dollars. Contractors: - M/S Petrofac and CCC. • Working as Lead Engineer on Qatar based Oil and Gas Projects with Qatar Gas, Qatar Petroleum as Major Clients. Work involves FEED, Conceptual Design and Detailed engineering work.
2.	**Bechtel India Pvt Ltd.**	Sr. Instrumentation and Control Engineer	End date: January 2017 Start date: August 2016	• Worked as TA, Checker/Reviewer on Engineering Deliverables and Vendor Print Reviews, guiding Engineers for efficient and Quality delivery of Project delivery and Tasks.

Ref No	Name of Employing Organisation	Position Title	End mm/yy Start mm/yy	Key responsibilities, activities undertaken, major achievements and/or projects. These should relate to your practice area description.
3.	**CH2M HILL HILL-VECO Engineering**	Sr. /Lead Instrumentation and Control Engineer and Deputy HoD	End date: July 2016 Start date: January 2014	• Lead I & C Engineer for Early Power plant project, based in Rumaila Oil Field, Iraq. Contractor: CPECC , Client: CNPC , BP • The Early Power Plant Project is an early part of the overall power generation for the Rumaila Oil Field. It will incorporate a standalone simple cycle power generation facility of 150 MW Capacity, using Heavy Industrial type Gas Turbines (GT), with fuel gas, being piped in from the local degassing stations. • The project also involves Degassing separator controls, Pipeline Leak detection and Pipeline Integrity Management System, including SCADA. • Responsible for Concept Engineering, FEED, Detailed Engineering, Brown Field Engineering including site visits and support. Leading a Team of Engineers in UAE and India to deliver on the project. • Site Visit to Degassing stations in Iraq, for tie-in Survey and meeting with Client Ops team.
4.	New Independent Power and Water Producer (IWPP) plant Mirfa, Abudhabi	Lead I&C Engineer	End date: December 2015 Start date: May 2014	The "Mirfa IWPP Plant" delivers a net power capacity between 1,400 to 1,600 MW and a net water capacity of 52.5. MIGD. The compositions of Mirfa IWPP plant is as follows. - Existing Four (4) Open Cycle Gas turbine generator (OCGT) (GE PG9171E). - Three (3) Gas turbine generator (GTG) units, each GTG with a bypass stack. - Three (3) HRSG units, each HRSG with a main supplementary firing. - Two (2) Steam turbine generator (STG) units. - New reverse osmosis seawater desalination plant - Modification of existing MSF units Contractor: - Hyundai Design, Engineering and Construction (HDEC), Seoul, Korea.

Ref No	Name of Employing Organisation	Position Title	End mm/yy Start mm/yy	Key responsibilities, activities undertaken, major achievements and/or projects. These should relate to your practice area description.
				OE Responsibility for review of detailed engineering documents, Coordination with Owner and government companies with regards to contractual issues, Vendor documents review, Participation in HAZOP, SIL Study, FAT-IFAT for Packages and Systems. Systems involved: - DCS, ESD, FGS, CEMS, VMS, PLC, Turbine control, Various Package control systems, Settlement Metering complying to MDEC codes.
5.	**PETROFAC INTERNATIONAL LTD.**	**Senior Design Engineer**	End date: January 2014 Start date: July 2014	Senior I & C Engineer for Upper Zakum, UZ750 Project - Island Surface Facilities by ZADCO. Project Value: 3.7 Bn USD (May-13 till Jan-14) Lump Sum Turnkey (LSTK) Engineering, Procurement, Construction and Commissioning (EPCC) works for installation of the islands surface facilities for the Production Build-Up (PBU) Phase that will achieve target oil production of 750,000 BOPD. The project includes implementation of modularization strategy to maximize the scope of work performed in fabrication yards and minimize the work on the islands. The work is spread over on the four artificial islands which are approximately 80 kms in the sea from Abu Dhabi. Project comprises of the following major facilities: • Well heads • Gas Lift Manifolds • Gas Injection Manifolds • Water Injection Manifolds • Produced Water Treatment Responsible for review of Engineering deliverables from Back Office in Chennai, Interaction with Client and PMC for comment resolutions on Basic and detailed Engineering documents, Model Review activities and handling interface issues with other EPC contractors. Lead Engineer; ICSS (DCS, ESD, FGS) on Iraq based Badra Oil Field development project. Project Value: 330 Mn USD (August-12 till July-13)

Ref No	Name of Employing Organisation	Position Title	End mm/yy Start mm/yy	Key responsibilities, activities undertaken, major achievements and/or projects. These should relate to your practice area description.
				The scope of work includes engineering, procurement, construction, pre-commissioning, commissioning, and start-up work on the Badra Oil Field development's central processing facility, which comprises three crude oil processing trains. The overall ICSS scope was around 4000 Hardwired I/Os and 12 Package interfaces. Job involved extensive coordination between Client (GAZPROM), Vendor (ABB) and back office engineering, ensuring integrated project delivery. Responsible for completeness of all the ICSS engineering documents required for FAT readiness. FAT activities involve Hardware checks, Graphic Checks, Functional checks, Application checks and IFAT for packages, enveloped within a tight schedule of one month period. Participation in SIL and Alarm Rationalization Studies. Attended IFAT at Linz, Austria for Instrument Air Compressor. Attended FAT for Liquid Metering Skid and Analyzer package provided by Alderly. Also, involved in HVAC Control systems FAT.
6.	Instrumentation on South Yolotan Gas Field Development Project in Turkmenistan	Senior Design Engineer	End date: October 2012 Start date: September 2011	• Project scope includes;10 billion cubic meters per annum (bcma) gas processing facility along with the infrastructure and pipelines for the entire 20 bcma development well pad facilities; gathering systems; gas processing and sweetening; sulphur handling, storage and export and condensate processing, storage and export facilities utilities and infrastructure including roads and rail loading facilities. • Job involved generating design inputs to vendors like DCS database, C&E, Control Narratives and subsequent review of vendor documentation. Involved in FAT activities related to DCS, ESD and FGS system (Experion, Safety Manager) supplied by Honeywell in Bulgaria. The Project scope involved 20000 Hardwire I/OS, 30 Serial Interfaces of packages, IFAT, FAT, Pre-FAT activities. Also, involved in HVAC Control systems FAT.

Ref No	Name of Employing Organisation	Position Title	End mm/yy Start mm/yy	Key responsibilities, activities undertaken, major achievements and/or projects. These should relate to your practice area description.
7.	Badra-Oilfield Project in Iraq by GAZPROM, Russia.	Instrumentation Lead	End date: August 2011 Start date: July 2011	Involved in estimation of instrumentation scope of work for Bid Proposal. **Departmental development work:** Development of Guidelines, Specifications, Requisition templates, and drawings based on lessons learned on various projects; Peer review/ auditing activities for various projects. Preparation of Guidelines documents on MPFM, Passive Cooled Shelters, Control Rooms, and Analyzers.
8.	**RELIANCE INDUSTRIES LTD**	Senior Manager	End date: July 2011 Start date: February 1998	Worked as Senior Manager, Instrumentation in Corporate Engineering Division, Reliance Industries Limited, Navi Mumbai. Worked on various in-house projects related to Petrochemical, Power, Petroleum, Retail outlets, Oil and Gas and Pipelines since 2000, in my capacity as Senior Instrument Design and Lead Engineer. Worked on Jamnagar Refinery Expansion Project. Was deputed to London, UK from Feb 2006 till end of 2007 for Basic and Detailed Design Engineering. Also responsible for delivering PMC services on various Projects.

CONTINUED PROFESSIONAL DEVELOPMENT (CPD) ACTIVITIES SUMMARY

DESCRIPTION OF ACTIVITY AND LEARNING. **Please record all relevant CPD activities (eg. short course, conference, reading, technical lectures, formal study towards qualification, research, discussion groups, workshops, symposia, voluntary service roles) that have extended your professional engineering knowledge and have assisted you to develop the knowledge profile of a professional engineer. Describe the learning outcomes and how these have contributed to your acquiring a Washington Accord level of knowledge..**	**Was Formal Assessment involved?** **What was the outcome?**

Date(s)	Actual Hours	Form of Activity	Title of activity	What was the knowledge you acquired? How have you applied this knowledge in your engineering practice?	
April 2019	10	Training	Resource planning and troubleshooting capabilities	Worked on carrying out planning and troubleshooting of various equipment.	Course Completion Certificate
February 2019	10	Training	Engineering Management	Worked on various project management tools which included manging the complete projects as well.	Course Completion Certificate
November 2018	8	Training	MS Office	Learnt various shortcodes included in MS Office.	Course Completion Certificate
October 2018	8	Training	BID Preparation	Learnt to prepare BID documents based on the company's process.	Course Completion Certificate
July 2018	8	Training	Instrumentation Equipment	Learnt the instrumentation handling and obtaining the results.	Course Completion Certificate

SECTION FIVE - PAYMENT

KNOWLEDGE ASSESSMENT (LEVEL 2) FEE PAYMENT

ASSESSMENT FEE (INCL GST) IN NZD | **NZ$1,351.25** | Please send a receipt ☐

CREDIT CARD DETAILS:

Visa ☐ Bankcard / Mastercard ☐ American Express ☐ Diners Card ☐

Credit Card Number

Name on card **Expiry Date** **CVV**

Cardholders Signature

WHERE TO SEND COMPLETED DOCUMENTS

Send the completed form and associated documents to the **IPENZ Membership Manager** at one of the addresses below:

Courier Address:
Engineering New Zealand
Level Six
40 Taranaki Street
Wellington 6011
New Zealand

Postal Address:
Engineering New Zealand
PO Box 12-241
Wellington 6144
New Zealand

Appendix One

COMPLEXITY DEFINITIONS

COMPLEX ENGINEERING PROBLEMS

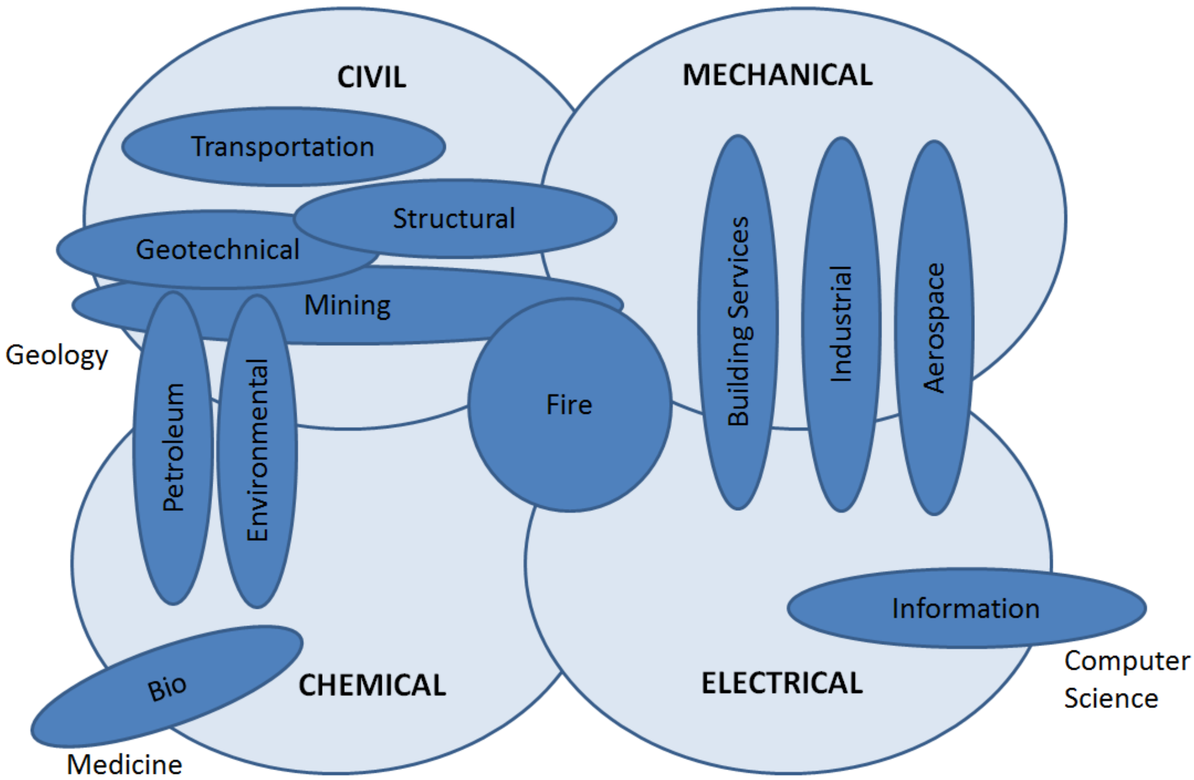
Complex engineering problems have some or all of the following characteristics:

- Involve wide-ranging or conflicting technical, engineering, and other issues;
- Have no obvious solution and require originality in analysis;
- Involve infrequently encountered issues;
- Are outside problems encompassed by standards and codes of practice for professional engineering;
- Involve diverse groups of stakeholders with widely varying needs;
- Have significant consequences in a range of contexts;
- Cannot be resolved without in-depth engineering knowledge

APPENDIX TWO

DISCIPLINES AND FIELDS OF ENGINEERING

Engineering practice fields are loosely defined terms and are used as an indication of the nature of engineering work carried out by engineers practising in an engineering field of practice. The following diagram is a graphical display of the relationships between the various fields and the four core disciplines. Some fields may extend into other fields of scientific endeavour.



AEROSPACE ENGINEERING

Aerospace engineering is the design, development, and production of aircraft (aeronautical engineering), spacecraft (astronautical engineering) and related systems. Aerospace engineers may specialise in aerodynamics, avionics, structures, control systems or propulsion systems. It may involve planning maintenance programmes, designing repairs and modifications and exercising strict safety and quality controls to ensure airworthy operations.

BIO ENGINEERING

Bioengineering draws heavily on the Chemical Engineering discipline and involves the engineered development of raw materials to produce higher value products, using biological systems (biological catalysts). The description also encompasses the general application of engineering to biological systems to develop new products or solve problems in existing production processes. As examples, bioengineers are found in medical research, genetic science, fermentation industries and industries treating biological wastes.

BUILDING SERVICES

Building Services engineering is the application of mechanical or electrical engineering principles, and an understanding of building structure, to enhance all aspects of the built environment from air conditioning and mechanical ventilation, electrical light and power, fire services, fire safety engineering, water and waste services, data and communications, security and access control, vertical transportation, acoustics and energy management.

CHEMICAL ENGINEERING

Chemical engineering is concerned with the ways in which raw materials are changed into useful and commercial end products such as food, petrol, plastics, paints, paper, ceramics, minerals and metals. Often these processes are carried out at large scale plants. Research of raw materials and their properties, design and development of equipment and the evaluation of operating processes are all part of chemical engineering.

CIVIL ENGINEERING

Civil engineering is a broad field of engineering concerned with the, design, construction, operation and maintenance of structures (buildings, bridges, dams, ports) and infrastructure assets (road, rail, water, sewerage). The Civil engineering discipline underpins several engineering fields such as Structural, Mining, Geotechnical and Transportation engineering, in which civil engineers often specialise. General Civil engineers are likely to be competent to undertake work that relates to one or more of these areas.

ELECTRICAL ENGINEERING

Electrical engineering is the field of engineering which deals with the practical application of electricity. It deals with the aspects of planning, design, operation and maintenance of electricity generation and distribution, and use of electricity as a source of energy within major buildings, industrial processing complexes, facilities and transport systems. It includes the associated networks and the equipment involved such as switchboards, cabling, overhead lines/catenaries, earthing, control and instrumentation systems.

Areas of specialisation within the wider electrical engineering discipline, such as electronics and telecommunications are usually concerned with using electricity to transmit information rather than energy. For this reason electronics and radiocommunications/telecommunications are captured under the field of Information Engineering.

ENGINEERING MANAGEMENT

The Engineering Management practice field is used by engineers who manage multi-disciplinary engineering activities that are so multi-disciplined that it is difficult to readily link their engineering practice with any other specific practice field. Project managers, asset managers and engineers working in policy development are likely to use the 'Engineering Management' field.

ENVIRONMENTAL ENGINEERING

Environmental engineering draws on the Civil and Chemical engineering disciplines to provide healthy water, air and land to enhance human habitation. Environmental engineers devise, implement and manage solutions to protect and restore the environment, within an overall framework of sustainable development. The role of the environmental engineer embraces all of the air, water and soil environments, and the interactions between them.

FIRE ENGINEERING

Fire engineering draws on knowledge from the range of engineering disciplines to minimise the risk from fire to health and safety and damage to property through careful design and construction. It requires an understanding of the behaviour of fires and smoke, the behaviour of people exposed to fires and the performance of burning materials and structures, as well as the impact of fire protection systems including detection, alarm and extinguishing systems.

GEOTECHNICAL ENGINEERING

Geotechnical engineering involves application of knowledge of earth materials in the design of structures, such as foundations, retaining walls, tunnels, dams and embankments. Geotechnical engineers assess the properties and performance of earth materials such as their stability and strength, and the impact of groundwater.

INDUSTRIAL ENGINEERING

Industrial engineering is the application of mechanical and electrical engineering principles to the design and operation of production equipment, production lines and production processes for the efficient production of industrial goods. Industrial engineers understand plant and procedural design, the management of materials and energy, and human factors associated with worker integration with systems. Industrial engineers increasingly draw on specialised knowledge of robotics, mechatronics, and artificial intelligence.

INFORMATION ENGINEERING

The field of Information engineering is based on the Electrical engineering discipline but also draws heavily from Computer Science. Three areas of further specialisation can be identified:

Software engineering - The development and operation of software-intensive systems that capture, store and process data.

Telecommunications engineering - The development and operation of systems that encode, transmit and decode data via cable systems (including fibre optics) and wireless systems (radiocommunications).

Electronics engineering - The design, development and testing of electronic circuits and networks that use the electrical and electromagnetic properties of electronic components integrated circuits and microprocessors to sense, measure and control processes and systems.

MECHANICAL ENGINEERING

Mechanical Engineering involves the design, manufacture and maintenance of mechanical systems. Mechanical engineers work across a range of industries and are involved with the design and manufacture of a range of machines or mechanical systems, typically applying principles of hydraulics (fluid control), pneumatics (air pressure control) or thermodynamics (heat energy transfer). Mechanical engineers may specialise in the Building Services or Industrial engineering field.

MINING ENGINEERING

Mining engineering involves extracting and processing minerals from the earth. This may involve investigations, design, construction and operation of mining, extraction and processing facilities.

PETROLEUM ENGINEERING

Petroleum engineering is a field of engineering relating to oil and gas exploration and production. Petroleum engineers typically combine knowledge of geology and earth sciences with specialised Chemical engineering skills, but may also draw on Mechanical engineering expertise to design extraction and production methods and equipment. Petroleum engineering activities are divided into two broad categories:

Upstream - locating oil and gas beneath the earth's surface and then developing methods to bring them out of the ground.

Downstream - the design and development of plant and infrastructure for the refinement and distribution of the mixture of oil, gas and water components that are extracted

STRUCTURAL ENGINEERING

Structural Engineering is a specialised field within the broader Civil engineering discipline that is concerned with the design and construction of structures. Structures might include buildings, bridges, in-ground structures, footings, frameworks and space frames, including those for motor vehicles, space vehicles, ships, aeroplanes and cranes, composed of any structural material including composites and novel materials.

TRANSPORTATION

Transportation engineering is a specialised field of practice in the civil engineering discipline relating to the movement of goods and people by road, water, rail and air.

A Transportation engineer might specialise in one or more of: pavement design, asset maintenance/management, construction/project management, traffic operations and control, transportation planning and systems analysis, freight transportation and logistics, road safety, railways or public transport systems.