KNOWLEDGE ASSESSMENT SELF REVIEW (FORM KA02)

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

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 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 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. As a Civil & Structural Engineer, I learnt various concepts related to the building design projects. I analysed the concepts which were related to the development of the multi-storied building projects with the appropriate utilization of the Structural Engineering concepts. There were subjects which I studied particularly Structural Engineering which boosted my technical knowledge in the Civil Engineering field. In the projects which I implemented, I made complete utilization of my Civil Engineering concepts and expertise underlying physical science which I made sure to achieve with the assistance of the numerous training program, self-learning, and appropriate self-development program and plan. I utilized advanced engineering concepts and analysed crucial project factors during the project which assisted in the efficient project execution.	1.4, 1.7, 1.9, 1.10, 1.11, 2.9, 2.10, 2.11, 2.12, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 4.10, 4.11

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.

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.	**Provide annotations to your supplementary evidence (document and page number)**
I applied the technical knowledge related to the Structural Engineering for solving various problems faced in the project and these technical skills were learnt during my bachelor degree in the Civil Engineering field at University of Calicut, India. I learnt to design the beams, columns and other building frame structure for completing the building design and it further comprehended the knowledge in the Structural Engineering domain. I analysed and discussed four work episodes in this project which I completed at different stages of my career and it strengthened my knowledge in the domain of Civil & Structural Engineering.	1.4, 1.2, 2.2, 3.4, 3.2, 4.5, 4.7

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.	**Provide annotations to your supplementary evidence (document and page number)**
• I did the implementation of the systematic theory while working on the Structural Engineering project. • I made an analysis on various factors when executing the project using my Structural Engineering concepts. • I made utilization of the subjects learnt in the Civil Engineering domain on the projects in which I worked as Structural Engineer under the directions of the project manager. • I always made sure to attend seminars related to the project held in the university as well as in the workplace related to the Civil Engineering designs for further comprehending my understanding in this faculty of Engineering.	1.9, 1.10, 1.11, 1.12, 1.13, 2.9, 3.8, 3.9, 3.10, 1.9, 1.11, 1.13, 2.11, 2.13, 3.8, 3.9, 3.10 2.9, 2.11, 3.7, 4.6, 4.8

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.	**Provide annotations to your supplementary evidence (document and page number)**
I implemented the system design with the computation made on various factors and the design selected always made feasible with the project related environment. I made in-depth analysis regarding the technical concepts related to the efficient building design project. I also made realization of the faults in the design and fixed them appropriately using my Civil & Structural Engineering knowledge. I also consulted with the project manager for broadening my horizons in this regard. Similarly, I made usage of my Civil & Structural Engineering knowledge in other projects which I executed throughout my job tenure at the companies.	1.11 2.7, 2.8 3.11, 3.12 3.13,3.14, 3.15, 3.9, 4.9

ELEMENT FIVE

Knowledge that supports engineering design.

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.

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

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. In all the projects, I made sure to strictly adhere the international standards and codes which assisted me well in achieving the quality results. I referred to the society of Civil & Structural Engineering while working on the drawings and the overall project designs. I did thorough feasibility analysis while implementing the multi-building design project. I utilized AUTOCAD software for the modification of the numerous technical drawings and utilized the Microsoft Excel for the development of the excel sheet template for estimation and budgeting purpose.	**Provide annotations to your supplementary evidence (document and page number)** 1.14, 2.11, 3.8, 3.13 3.9 3.10 3.10 3.8 2.14 1.9 2.13, 4.7

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

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.	**Provide annotations to your supplementary evidence (document and page number)**
I applied my Structural Engineering knowledge when achieving the quality results in the project with the efficient utilization of different softwares. I made usage of the AUTOCAD software for completing the building designs along with the implementation of the technical drawings linked with the project. There was the continuous usage of the Microsoft Excel tool for the development of the special template which was utilized for the estimation purposes. I did the modifications in the drawing with my technical software expertise and adopted and implemented the structural approach when executing the design works associated with the project. I took part in regular team meetings for continuously monitoring the progress of the project. I always presented the working methodologies during the projects and key results were mostly presented using the Microsoft PowerPoint tool.	1.9, 2.9, 2.13, 3.8 2.13 2.14 2.9, 3.8 3.10 1.15, 1.7, 2.6, 2.15, 3.6, 3.18 1.18, 2.16, 3.19, 4.9

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 behavior 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 projector business constraints, and understanding of techniques to mitigate, eliminate or minimize 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.	**Provide annotations to your supplementary evidence (document and page number)**
I as a Civil & Structural Engineer always made sure to play my active role in the society for fulfilling various responsibilities. There was the significant impact raised in myself because of the adequate completion of an engineering degree. I made significant progress in the field of chemistry, mathematics and physics. I also managed to obtain an enhancing trend related to the professionalism in different fields. I implemented my following responsibilities as an Engineer in the society: • Ethical Conduct • Client & Public Welfare and Safety Welfare • All the legal liabilities • Communication • Quality Standards	1.9, 2.9, 2.13, 3.8 2.13 2.14 2.9, 3.8 3.10 1.15, 1.7, 2.6, 2.15, 3.6, 3.18 1.18, 2.16, 3.19, 4.10

• Responsibilities related to Environment	

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)**
I made utilization of the advanced concepts related to the Civil & Structural Engineering with the usage of the software like AUTOCAD. This software was used for drawing and modifying the engineering designs with the appropriate implementation of the engineering concepts. I also obtained decent feedback from the team members as well as from the project manager while making adequate corrections in the technical drawings. It also assisted in boosting my software utilization skills and I completed the technical courses and practical training on other softwares. I incremented my technical knowledge with all these courses completion and it played a positive role in my engineering career. Moreover, I also focused on the self-development during the projects with the reading of various technical papers in this regard and I made positive usage of the internet sources and even discussed various technicalities with the senior colleagues.	1.4, 1.5, 1.6, 2.6, 2.7, 2.8, 3.8 1.6 1.16, 3.7, 4.10, 4.12

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**
WE 1.1 Overview of the project	
WE 1.1.1: This project consists of analysis and design of a multistoried commercial bank building, situated at Poonkunnam in Thrissur district. This project was completed during my degree program at University of Calicut, India. The building consists of 6 stories (G + 5). Designing and detailing are as per relevant IS codes. The dead load and live load of various frames of building will be analyzed by Moment Distribution Method and wind load will be analysed by Portal Fame Method. Structural members, slabs, beams, columns, stairs and pile foundations will be designed using Limit State Method according to the provision of IS: 456 – 2000 and SP 16 using M25 concrete and Fe 415 steel. Analysis and design will be done and the results will be cross checked using STAAD Pro 2008.	**One** **Two**
WE 1.1.2: The project objectives were: • The analysis carried out along with the main structural elements design of the multi-storey building which include beams, columns, slabs, water tank, foundation and septic tank. • Structural software familiarity along which include AutoCAD, Staad Pro. • Appropriate engineering practices made.	
WE 1.2 Your role and responsibilities	
WE 1.2.1: I worked on the three major step of this project and applied my Civil & Structural Engineering understanding appropriately:	

- Planning
- Design (including analysis)
- Construction.

These steps were the backbone in the project which I implemented with the utilization of my Civil Engineering concepts. **One**

WE 1.3 Complexities (using the complexity definitions) and challenges of the project

WE 1.3.1 (Problem 1): There was the technical issue faced regarding the appropriate calculations of the moment of side walls which was needed to be solved.

Solution: I sorted it by splitting the moments for the long and short walls using my technical knowledge.

For Long walls:

$$(pL^2/12) = 20 \times 7.26^2/12 = 87.85 \text{ kNm}$$

$$(pL^2/8) = 20 \times 7.26^2/8 = 131.77 \text{ kNm}$$

For Short walls:

$$(pB^2/12) = 20 \times 4.23^2/12 = 29.82 \text{ kNm}$$

$$(pB^2/8) = 20 \times 4.23^2/8 = 44.73 \text{ kNm}$$

Five

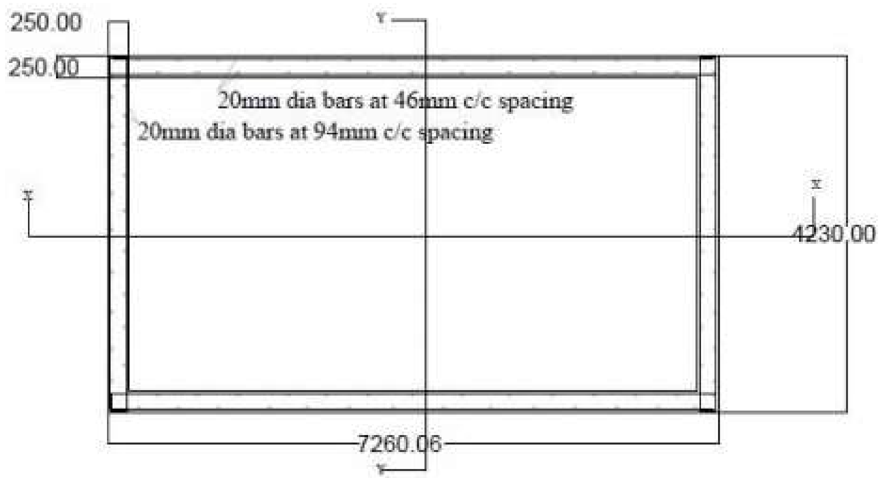
0.63	0.37	0.37	0.63
29.82	-87.85	87.85	-29.82
36.56	21.47	-21.47	-36.56
66.38	-66.38	66.38	-66.38

WE 1.3.2 (Problem 2): In the detailing of water tank, there was an issue faced regarding the diameter of the bars which was required to be sorted.

Solution: I applied technical skills related to the Civil Engineering knowledge and set the appropriate spacing based on the available area. The drawing was implemented in AUTOCAD and attached below:

Two

Two



Four

WE 1.4 How does this project demonstrate application of your engineering knowledge?

WE 1.4.1 Calculations carried out: I carried out the load calculations as indicated below.

Concrete = 25 KNm^3 Brick work = 20 KNm^3 Dimension of Brick wall = 230 mm x 3500 mm (including beam depth) **Loads on each floor** (As per IS 875, Part 2) Floor finishes = 1 KN/m^2 Live load for roof slab = 3 KN/m^2 Live load for banking halls = 3.5 KN/m^2 Live load for strong rooms = 5 KN/m^2 Live load for corridors and passages = 4 KN/m^2 Live load for toilet = 2 KN/m^2 I did the slab designing based on the following calculations:	<u>**Four**</u>

Size of room : 5.1 m x 4.7 m

Grade of concrete, f_{ck} : 25 N/mm^2

Grade of steel, f_y : 415 N/mm^2

As per clause ***23.2.1 of IS 456 : 2000***

Basic values of span to effective death ratios for span up to 10 m for ***continuous slabs,***

Span/effective depth = **26**

Assuming Pt = 0.3 %

Stress in steel f_s = $0.58 f_y * A_{strequired} / A_{st\ provided}$

= 0.58 x 415 = 240.7 MPa

Modification factor for tension reinforcement = 1.7

Span/effective depth = 26x1.7

Therefore, effective depth = 4.7x1000/ (26x1.7)

d = 106 mm

Assuming mild exposure, ***from Table 16***

Clear cover = 15 mm

Assuming 10mm φ rods,

Total depth = 106+20+10/2 = 131 mm.

D = 140 mm.

WE 1.4.2: This project included the functional planning, analysis and design of a multi-storeyed bank building. The building was completely a framed structure. Planning phase was completed and the height of the building was 21.6 m. The plans were drawn using AutoCAD 2010. Preliminary design and load calculation were done. Analysis and design is done and the results are cross checked using STAAD. Pro. V8i. I have done the project at my best of the knowledge and satisfied the essential requirements. Care has been taken in design and code stipulations has been strictly followed.

WE 1.4.3 Project management

I attended meeting with the project supervisor on regular basis for discussing the project progress and implemented planning and design. Furthermore, the alterations needed to optimize the task in a significant manner were also discussed and analysed.

I conducted everyday meeting with the project supervisor for discussing the technical concepts linked with the project and sorted the technical glitches which I faced while executing the project with the implementation of my appropriate project management skills.

I significantly boosted my leadership skills in an adequate manner and solved the problems linked with the project with my Civil Engineering skills utilization. My project management skills assisted me in completing the project within the time and I even ensured that there was no overrun in the budget and the project schedule.

Moreover, I worked on answering the technical queries raised by the project supervisor and made necessary changes accordingly in the project according to his instructions.

WE 1.4.4 Software's used

AUTOCAD
STAADPRO

WE 1.4.5 Engineering Standards

IS: 456 – 2000

WE 1.4.6 Resource Usage

I made thorough research on various factors linked with the project with the proper utilization of internet. I learnt various engineering related concepts and implemented them accordingly as the project was progressing.

I made usage of the drafting personnel in an appropriate manner and utilized the consistent and productive drawings set and ideas were delivered accordingly. I implemented all the necessary calculations as needed for obtaining the adequate analytical results as well in the project.

Work/Study Episode 2	Element
WE 2.1 Overview of the project: There was the comparative research made on the concrete properties effect when grade 20 and 30 ordinary Portland cement was replaced with the fly ash. There was the main variation obtained with the 0%, 10% and 20% fly ash dosage with the optimum value was obtained at 15%. The project was done while carrying out my Bachelor of Technology degree in Civil Engineering domain at University of Calicut, India. **WE 2.1.1**: The project objectives were: • Exploring the cement replacement part possibility with the fly ash by means of the incorporation of the fly ash amounts and reduction of the cement parts with the prevention made on the environmental contamination with the appropriate waste disposal. • Determination of the fly ash optimum amount with the influence made on the conventional strength concrete properties • Fly ash concrete and normal concrete strength comparison. • Workability and higher strength concrete mix effect with the fly ash varied percentage of cement.	**One**
WE 2.2. Your role and responsibilities **WE 2.2.1** My key responsibilities were: • Promoting the usage of the fly ash to the higher extent in the cement concrete and worked on the reduction of the environmental impacts made from the cement industries. • Worked on the concrete strength long age and realizing the mechanical properties which include tensile strength, compressive strength, workability, etc. in varied stages of the concrete. • Reduction made on the cement content amount along with the hydration (heat) took into consideration for the cement concrete mix. The environmental friendly impact was obtained from the construction work based on the usage of the fly ash.	**Four**
WE 2.3 Complexities (using the complexity definitions) and challenges of the project **WE 2.3.1 (Problem 1):** There was the problem faced regarding the initial setting of time which was required to be executed perfectly. **Solution:** I did the initial setting time which was the time elapsed between the moments that the water was added to the cement, to the time the paste started losing its plasticity. I made usage of the Vicat apparatus which had the needle of 50mm length and the elapsing time period was between the time when the water was summed to the cement. It was also based on the time when the needle penetrated the test block which have the depth equal to the 35mm from the initial setting time. There was the figure which was related to show the Vicat apparatus utilized for the determination of the initial setting cement time and table illustrates the test results of initial setting time of cement.	**Two**

Quantity of cement	400
Water for standard consistency (p)	0.85×p×cement in gm
Water added = 0.85×0.36×400	122.40 ml
Penetration reading (mm)	**Time of reading (minute)**
0	5
1	10
2	15
3	20
3	25
4	30
5	34
Initial setting time of cement = 34 minute	

Five

WE 2.3.2 (Problem 2): There was the issue raised regarding the specific gravity of cement which was required to be evaluated by proper testing.

Solution: I determined the specific gravity of cement, kerosene which does not react with cement was used. Le Chatelier's flask or specific gravity bottle was used for determining the specific gravity. The standard value for the specific gravity of OPC of grade 53 was 3.2. The Figure below shows a typical specific gravity bottle and Table shows the test results of specific gravity test of cement.

Three

Four

Description	1
Weight of empty dry bottle (W_1)	35
Weight of bottle + kerosene (W_2)	74
Weight of bottle + cement (W_3)	51
Weight of bottle + cement + kerosene (W_4)	86.6
Weight of bottle + water (W_5)	92
Weight of cement (W_3-W_1)	16
Specific gravity	**3.2**

Five

WE 2.4 How does this project demonstrate application of your engineering knowledge?

WE 2.4.1 Calculations carried out: The M20 Concrete was designed based on the following steps and it was as per the IS method:

Step 1: Target strength for mix proportioning Standard deviation = 4 (Based on Table 1 of IS: 10262-2009) Target strength = 26.6 N/mm^2 Step 2: Selection of water - cement ratio Maximum water - cement ratio = 0.60 Water - cement ratio = 0.51 (From Fig. 2 of IS 10262:1982) Adopted water-cement ratio = 0.51 Step 3: Selection of water content Maximum water content: For selected size of aggregate = 186 litres (For angular aggregates and 25 to 50mm slump) Correction for type of aggregate = 186 litres Estimated water content for given slump = 197.16 litres Percentage of water content reduction due to use of Super plasticizer = 25%	**Seven**

Final arrived water content = 147.75 litres

Step 4: Calculation of cement content

Water - cement ratio = 0.51

Cement content = 289.7 Kg/m^3

Minimum cement content = 240Kg/m^3 (From Table 5 of IS: 456-2000)

Final arrived cement content = 289.7 Kg/m^3

Step 5: Proportion of volume of coarse aggregate and fine aggregate = 0.62 (From Table 3 of IS 456-2000, for water - cement ratio of 0.50)

Corrected proportion of volume of coarse aggregate for selected water-cement ratio =0 .598

Proportion of volume of fine aggregate = 0.402

Step 6: Mix calculations

- Volume of concrete = 1m^3
- Volume of cement = 0.090 m^3
- Volume of water = 0.1475 m^3
- Volume of chemical admixtures = .003945 m^3
- Volume of all in aggregate = 0.6759 m^3
- Mass of coarse aggregate = 1252.71 Kg
- Mass of fine aggregate = 800.93 Kg

Final Trial Proportion

Cement = 289.7 Kg/m^3

Water =147.75 litres

Chemical admixtures = .003945 m^3

Fine aggregate = 800.93 Kg

Coarse aggregate = 1252.71 Kg

Water - cement ratio = 0.51

WE 2.4.2 Engineering testing: I carried out the slump testing of the fresh concrete along with other related tests. Slump refers to workability of a concrete mix. Slump test was used to measure the consistency of concrete by filling a conical mould with a sample of concrete. Then mould was inverted over a flat plate and the mould was removed. The amount by which the concrete drops below the mould height was measured and this represents the slump. The Figure below shows the 100mm slump.

WE 2.4.3 Project management

I constantly met with the project supervisor throughout the project and managed the project objectives while completing it within the project timeline. I also discussed the modifications needed in the project for the successful implementation.

I even managed to discuss the everyday task with the project supervisor in a weekly meeting conducted at his office.

I executed the project tasks with the appropriate skills implementation linked with the project management and also managed to boost my knowledge in this domain.

I also made significant increment in my project management skills and problem solving techniques. This technique assisted me well in complete the project within the schedule and I also managed to learn about the ideal and physical learning environment.

WE 2.4.4 Software used

- AUTOCAD
- MS OFFICE

WE 2.4.5 Engineering Standards

- IS: 456 – 2000

WE 2.4.6 Resources Allocation

This university based project had significant influence in my Civil Engineering understanding and I got adequate project experience while working on this project. I made utilization of various soft and technical skills throughout this process. This project was completed under the directions of the project supervisor and he also assisted me well in improving my project leading and management skills. I gained adequate knowledge on the factors associated for the successful completion of the project. I made increment in my technical skills knowledge which even included researching and report writing abilities. I also implemented the adequate knowledge for solving the technical issues linked with the project. I made significant improvement in my overall project implementation knowledge with the successful execution of this project.

Work/Study Episode 3	Element
WE 3.1 Overview of the project	
WE 3.1.1: The project objective was based on proposing new dwelling at 71 Jackson Road, OHOKA for the client Green Land Homes.	**One**
WE 3.1.2: The site is located at Jacksons Road in Ohoka. The site has flat topography and was vacant at the time of this investigation. The site has been classified as “Green Zone, N/A - Rural & Unmapped” by the Canterbury Earthquake Recovery Authority (CERA) area-wide land technical categories. The Environment Canterbury report R12/83 indicates the site is in an area where damaging liquefaction is unlikely. Hence the site characteristics may be consistent with a “Technical Category 1 (TC1)” classification.	
WE 3.2 Your role and responsibilities	
WE 3.2.1: I had the below key responsibilities in the project: • Completing the foundation footprint excavations prior to placing of hard-fill. • Completing the foundation reinforcement prior to pouring of concrete. • Completion of the Structural steel and timber works before concealment.	
WE 3.3 Complexities (using the complexity definitions) and challenges of the project	
WE 3.3.1 (Problem 1)	
WE 3.3.1.1: Problem: I noted an issue with the waffle slab during the design and it was solved with my Civil Engineering knowledge.	
Solution: Following points were recommended for the waffle slabs: • Excavate building footprint to the minimum depth noted or until all topsoil was removed, whichever is greater. Backfill with compacted AP40. All fill was crushed aggregate, placed and compacted in 200mm layers. • Backfill shall extend outwards from the building footprint minimum 200mm, or batter slope 2:1, whichever was greater • Polystyrene pods 1100 x 1100 x 220mm (typ.) • Slab thickness 85mm min. or 110mm min. with underfloor heating	
WE 3.4 How does this project demonstrate application of your engineering knowledge?	
WE 3.4.1 Calculations carried out	
WE 3.4.2: The following load calculations were carried out:	

$R_1 = \frac{P}{l}(l - a + b)$

$a = 1.3$
$b = 0.3$
$l = 5.$

$= \frac{2.9}{5}[5 - 0.3 + 1.3] - \frac{1.5 \times 6}{5} = 1.8 \text{ kN}$

$R_2 = \frac{P}{l}[l - b + a] = \frac{1.5}{5}[5 - 1.3 + 0.3] = 1.2 \text{ kN}$

$M_1 = R_1 a = 1.8 \times 1.3 = 2.34 \text{ kN/m.}$

$M_2 = R_2 b = 1.2 \times 0.3 = 0.36 \text{ kN/m.}$

$\phi M_n = \phi k_1 k_4 k_5 k_8 f_b Z$

$\Rightarrow Z = \frac{bd^2}{16} = \frac{90 \times 240^2}{6}$

$= \underline{\underline{864}}\,000$

For 240 × 90.

$\phi = 0.8$

$k_1 = 0.6$

$k_5 = 1$

$k_8 = 0.9$

$f_b = 14.$

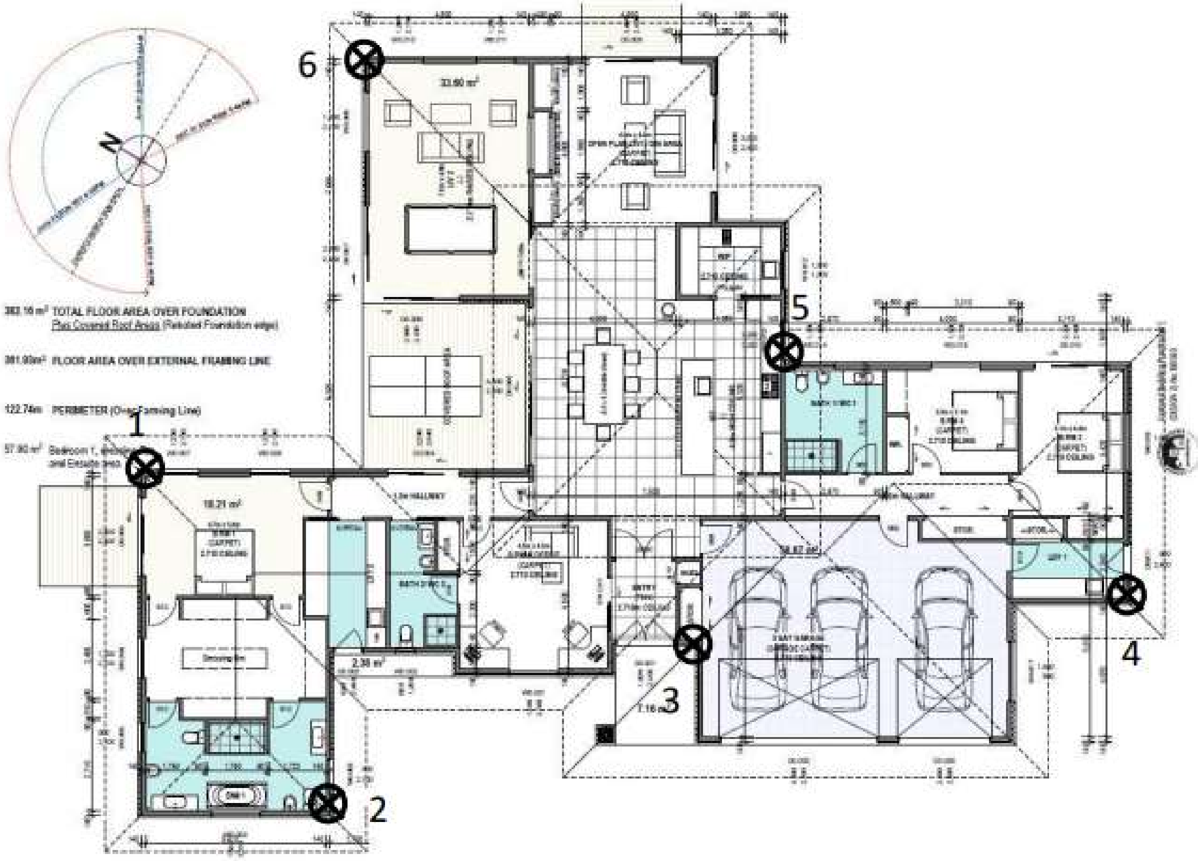
Four

Three

Five

$\phi M_n = 5.2$ kNm > 2.34 kN/m $\boxed{\text{V. \& } \Delta \text{ - ok by Observat}^n}$ Use - 2/240x45 SG8 for R_f Use - Bow Mac 'B108' - For connections. For shear Force $V^* = 1.8$ kNm $\phi V_n = 75.1$ for one bot. $\phi V_n > V^*$ - Hence ok. For bending moment $M^* = 1.5$ kNm $\phi M_n = 22.4 \times 0.081 = 1.8144$ kN. Lever arm = 186 - 50 - 55 = 81 mm $M^* < \phi M_n \rightarrow$ ok. Provide Bow Mac - B108.	**Six** **Eight**

WE 3.4.1.1 Testing: The shallow soil investigation consisted of 6 dynamic cone penetrometer (DCP or also known as scala penetrometer) tests to determine the soil's ultimate bearing capacity and 2 hand augered boreholes to determine the nature of the underlying soil type. The test locations and results of the DCP tests are given on the attached test location plan and borelogs. The borelog at test location 2 revealed approximately 100mm of top soil overlaying a 300mm layer of dark brown silty clay, followed by 200mm layer of white silty clay. The hand auger refusal was met at 600mm below natural ground level (NGL). The borelogs at test locations 4 revealed approximately 100mm of top soil overlaying 300mm layer of brown silt, followed by 300mm layer of light brown silty clay with white spots down to termination depth 700mm below NGL. Static water was not encountered during this investigation. The "good ground" requirements of NZS 3604 can be achieved at all test locations from 400mm below NGL (NZS 3604 requires 5 DCP blows per 100mm penetration for a depth of 2 times the footing width immediately underneath the footing, and 3 DCP blows per 100mm penetration thereafter). **WE 3.4.1.2** The test results indicate that the "good ground" criteria of NZS 3604 can be achieved to the site footprint. Standard shallow foundation in accordance to NZS 3604 can be adopted for the proposed dwelling. It is recommended to excavate to a minimum depth of 400mm below NGL for the building footprint prior to the construction of the foundations, or remove all topsoil, organic soil, and soft soil, whichever was greater. The test location plan is indicated below:	**Seven** **Seven**

	**Eight** **Three**

WE 3.4.4 Project management **Six**

I conducted regular meetings with the project manager along with other project related team members and discussed the project technical objectives with them which led towards the successful project implementation.

I also took approval from the project supervisor while making any changes in the project for the better optimization.

There were meetings which I made with the sub ordinates for discussing the technical aspects and sorted the issues related to the project. I also discussed the man hours and mandatory man power required for the project implementation.

There was the appropriate enhancement made in the project with the executed leadership skills which made me proactive in the project and I sorted the issues utilizing the technical and managerial experience in the project. There was the adequate project technical analysis made under the project supervisor's guidance throughout the project which brought adequate project outcome.

WE 3.4.5 Software used

AUTOCAD

WE 3.4.6 Engineering Standards

- NZS 3604

WE 3.4.7 Resources Allocation

I gained adequate experience throughout the project when executing this project with the team members and implemented the civil engineering activities in an adequate manner. I learnt and executed the technical skills thoroughly in the project with the right resources allocation and this was under the supervision of the project manager. There was an adequate increase in my leadership skills when executing the project and managing the technicians and labours working on the project. I gained decent communication skills with this project successful execution and made sure to utilize them in the other projects as well. **Four**

Work/Study Episode 4

WE 4.1 Overview of the project

WE 4.1.1: The project was based on the structural beam, post, pile, bracing and perimeter foundation design on which I worked as Junior Structural Engineer at Cephas Rock Limited. **Two**

WE 4.1.2: The site is located west of Harris Crescent in Papanui. The site has flat topography and there were existing buildings on site at the time of this investigation. The site is classified as “Green Zone, Technical Category 2, yellow” area as given by the Canterbury Earthquake Recovery Authority (CERA). This means that minor to moderate land damage from liquefaction was possible in future large earthquakes. The shallow soil investigation consisted of 5 dynamic cone penetrometer (DCP or also known as scala penetrometer) tests to determine the soil’s ultimate bearing capacity and 3 hand augered boreholes to determine the nature of the underlying soil type. The test locations and results of the DCP tests are given on the attached test location plan and borelogs.

Four

WE 4.2 Your role and responsibilities

WE 4.2.1: In this project, I implemented the following activities:

- I did the preparation of the structural designs.
- I implemented the drawings in AUTOCAD software.
- I also utilized ETAB and SpaceGass.
- I applied adequate knowledge in steel, timer and reinforced concrete structures.
- I did the construction monitoring, site inspections and report making.
- I completed the damage assessment and report writing.
- I carried out the shallow soil investigation tests (scalar penetrometer and hand auger) and report making.
- I followed all the NZ standards and MBIE guidelines.

WE 4.3 Complexities (using the complexity definitions) and challenges of the project

Six

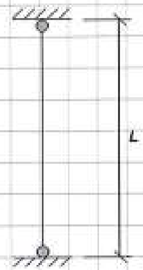
WE 4.3.1 (Problem 1)

WE 4.3.1.1 Problem: There was the issue faced in the design regarding the foundation and floor framing plan and it was required to be sorted out accordingly.

Solution: I sorted out this design issues with the implementation of the following steps:

- I did the verification of all the dimensions required for set-out and construction.
- I made sure that the pile spacing indicated in both direction was set at the maximum allowable spacing.
- I confirmed the final pile setting.

WE 4.4 How does this project demonstrate application of your engineering knowledge?	Three
WE 4.4.1 Calculations: I carried out the Timber Post Design necessary calculations as shown below:	



N_c = **16.0** [kN]

L = **2500** [mm]

From NZS 3603 - Cl. 3.3.4: $N_c < \phi N_{ncx}$ and $N_c < \phi N_{ncy}$ shall be satisfied.

$\phi N_{ncx} = \phi k_1 k_8 f_c A_p * 10^{-3}$ - k_8 is calculated using S_2

$\phi N_{ncy} = \phi k_1 k_8 f_c A_p * 10^{-3}$ - k_8 is calculated using S_3

With: f	=	0.8		
k_1	=	0.6		- Load Reduction Factor
k_{10}	=	1.0		- Pinned Post - Fig. 3.5
f_c	=	18	MPa	- strength parallel to the grain
f_p	=	8.9	MPa	- strength perpendicular to the grain

Try **90x90** Post with b = 90 [mm]

d = 90 [mm]

Section Area A = 8.10 $*10^3$ [mm^2]

Calculate Slenderness Factors S_2 and S_3:

$S_2 = k_{10} L/d = 27.8$ $K_{8S2} = 0.407$

$S_3 = k_{10} L/b = 27.8$ $K_{8S3} = 0.407$

The critical forces then are:

$\phi N_{ncx} = \phi k_1 k_8 f_c A_p * 10^{-3} = 28.5$ [kN]

$\phi N_{ncy} = \phi k_1 k_8 f_c A_p * 10^{-3} = 28.5$ [kN]

Showing that N_c = **16.00** [kN] < ϕN_{ncx} = **28.49** [kN] holds, and

N_c = **16.00** [kN] < ϕN_{ncy} = **28.49** [kN] holds, hence

Stability check is OK!

.3.2. CHECK BEARING - Post section.

From NZS 3603 - Cl. 3.2.9: $N_b < \phi N_{nb}$, where $N_b = N_c$ = 16 [kN]

Parallel to the grain - $\phi N_{nbl} = \phi k_1 f_c A_p * 10^{-3}$ = 70.0 [kN]

Showing that N_b = **16.00** [kN] < ϕN_{nbl} = **69.98** [kN] holds, hence

Check Bearing - Post Cross Section - is OK!

.3.3. CHECK BEARING - Bottom Plate.

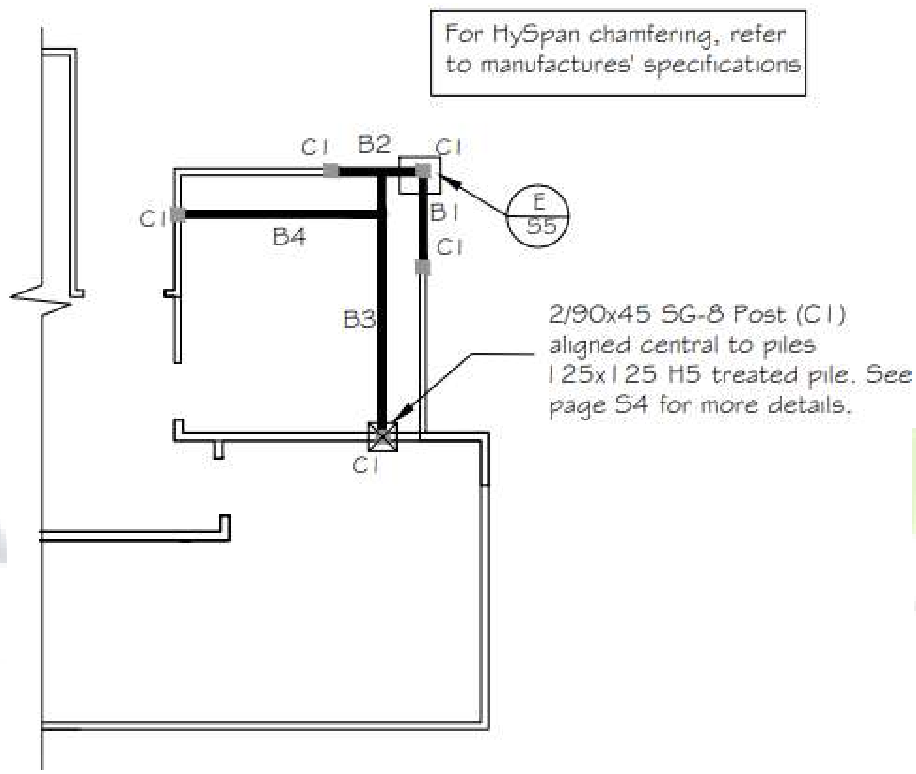
From NZS 3603 - Cl. 3.2.9: $N_b < \phi N_{nb}$, where $N_b = N_c$ = 16.0 [kN]

Perpendicular to the grain - $\phi N_{nbp} = \phi k_1 f_p A_p * 10^{-3}$ = 34.6 [kN]

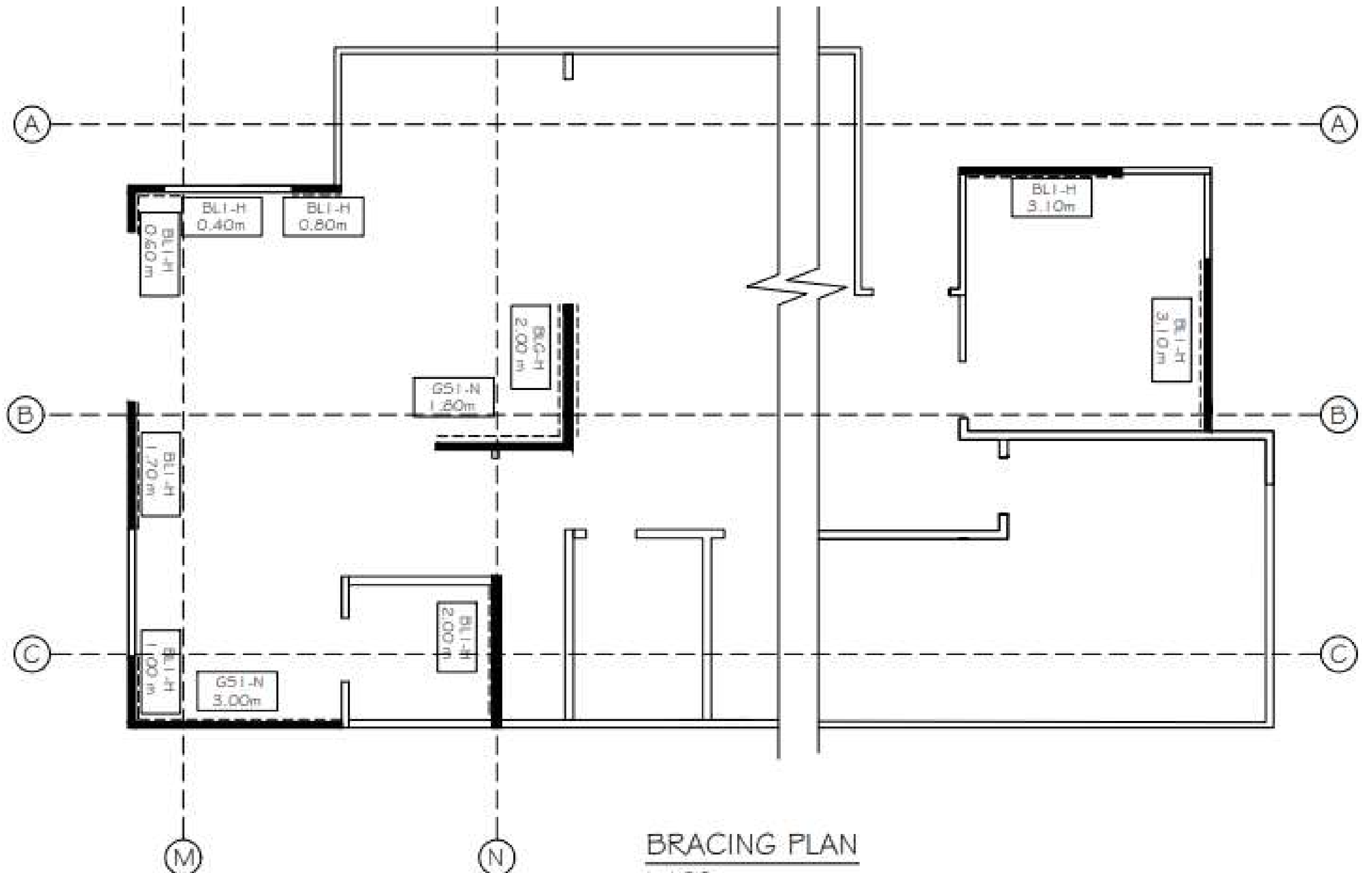
Showing that N_b = **16.00** [kN] < ϕN_{nbp} = **34.60** [kN] holds, hence

Check Bearing - Bottom Plate - is OK!

Summary: Provide **90x90** Post for beam **B1** support.

WE 4.4.2: I implemented the beam layout part as shown in the drawing below. 	<u>**Eight**</u>

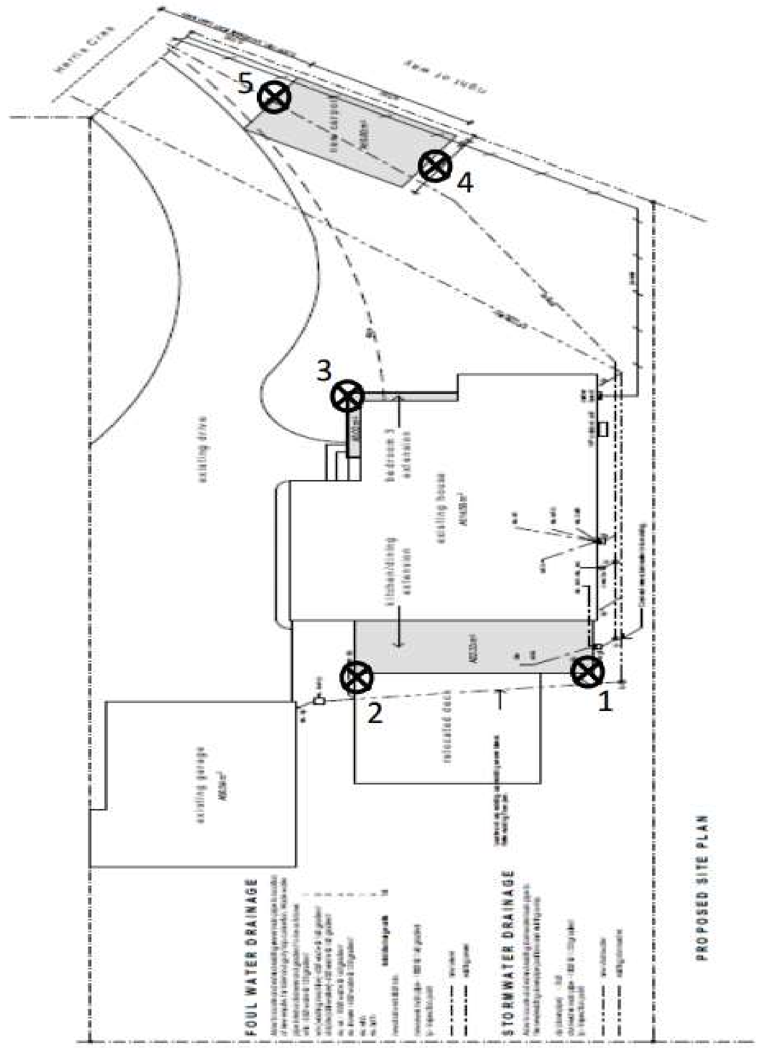
I implemented the bracing plan as shown in the drawing below.



BRACING PLAN
1:100

WE 4.4.1.1 Procedure: **Seven**

I carried out the bore-log at test location 2 for revealing the approximate 200ml of the topsoil, overlaying 400mm of the brown clayey slit. I managed to obtain the hand auger refusal which was met at 600mm below natural ground level (NGL). I revealed the bore-log at test location 5 which was approximately 200mm of the topsoil along with the overlaying of the brown slit which was 500mm. I implemented the hand auger refusal which was met at 700mm below the natural ground level (NGL). There was encountered static water at approximately 2600mm below NGL at location 5 during this investigation. I carried out the DCP test results around the carport area which was revealed with the 2 DCP blows per 100mm penetration and it can be achieved at each test locations from 300mm below NGL. This is equivalent to an inferred Ultimate Bearing Capacity (UBC) of 200 kPa and results at around dwelling extension area showed that 3 DCP blows per 100mm penetration was achieved at each test locations from 200mm below NGL, it was equivalent to UBC of 276 kPa. **WE 4.4.2.1** I implemented the test and following conclusions were drawn: **Main Dwelling** As the site is classified TC2, the "good ground" requirements of NZS3604:2011 cannot be satisfied. Therefore, specific engineering design for the proposed dwelling extension is required. The MBIE TC2 enhanced concrete slab foundation options, such as waffle slabs, or timber pile foundations (matching with existing), are considered to be suitable for the site. An ultimate bearing capacity of 276 kPa is inferred to be achievable from 200mm below NGL. **Garage** Even though, the site was classified as TC2, the proposed garage was of importance level-1 (structures presenting a low degree of hazard to life or property). However, due to the low bearing capacity the "good ground" requirements of NZS3604:2011 were not satisfied. NZS3604:2011 type foundations were still suitable, however specific engineering design was required to determine if any modifications were required to suit the achievable bearing capacity. An UBC of 200kPa was inferred to be achievable from 300mm below NGL. It was recommended to excavate to a minimum depth of 200mm and 300mm below NGL for the building and garage footprint respectively prior to the construction of the foundations, or remove all topsoil, organic soil, and soft soil, whichever was greater. The drawings implemented are shown below.	**Eight**


5
4
3
2
1
new carport
existing drive
bedroom 3 extension
existing house
kitchen/dining extension
relocated deck
existing garage
FOUL WATER DRAINAGE
STORMWATER DRAINAGE
PROPOSED SITE PLAN

WE 4.4.4 Project management **Four**

I made sure to attend all the technical meetings which were headed by the project manager and I made sure to utilize my managerial skills in the project in an adequate manner.

Furthermore, there were various alterations made in the project for the better optimization and resulted in optimum project output.

I also discussed various issues with the colleagues regarding the project and sorted them well with the mutual consent under the project manager’s supervision.

Six

There was the adequate increment made in the project management skills because of my active role in the project and it assisted me well in completing the project within the time.

WE 4.4.5 Software used

AUTOCAD
ETAB
SpaceGaSS

Seven

WE 4.4.6 Engineering Standards

NZS 3916:2013

WE 4.4.7 Resources Allocation

Eight

This project assisted me in gaining significant experience while working with the team and following the design process. There were various soft skills and technical skills which I followed throughout the process. There was significant experience gained by me when working on the project and also enhanced my communication and leadership skills in the project. I also managed to increment my technical skills which include report writing and researching which were needed to be applied throughout the project. There were even some of the related information for solving and it was really a challenge to find. Because of this, I gained adequate experience in finding the appropriate information and it assisted me in improving my investigation and researching skills.

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	1.9, 1.10, 1.11, 1.12, 1.13, 1.14	2.9, 2.10, 2.11, 2.12	3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15	4.9, 4.10, 4.11, 4.12
2. Application of knowledge of mathematics	1.9, 1.11, 1.13	2.9, 2.11, 2.13	3.8, 3.9, 3.10	4.8, 4.10
3. Application of knowledge of engineering fundamentals	1.9, 1.10, 1.11, 1.12, 1.13	2.9, 2.10,2.11, 2.13	3.7,3.8, 3.9, 3.10	4.5, 4.7, 4.8
4. Application of specialist engineering knowledge to solve complex problems	1.11	2.7, 2.8	3.9,3.11,3.12,3.13, 3.14, 3.15	4.6, 4.8, 4.11
5. Application of knowledge of design methods to solve complex problems	1.9, 1.14	2.11, 2.13, 2.14	3.8, 3.9, 3.10, 3.13	4.5, 4.7, 4.10, 4.12
6. Application of knowledge of key elements of engineering practice	1.9, 1.7, 1.15, 1.18	2.9, 2.13, 2.14, 2.15, 2.16	3.6, 3.8, 3.10, 3.18, 3.19	4.3, 4.6, 4.8, 4.9, 4.10
7. Role of Engineering in Society	1.6,1.16, 1.19,1.20	2.7, 2.8, 2.17	3.12, 3.13, 3.14, 3.15, 3.17, 3.18, 3.20	4.1, 4.3, 4.4, 4.7
8. Application of advanced knowledge in an area of your discipline	1.6, 1.16	2,11, 1,12	3.7, 3.8	4.5, 4.9, 4.10

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 achieveme projects. These should relate to your practice area descriptio
1.	Cephas Rock Limited- Structural Engineering Consultants, Christchurch, New Zealand	Junior Structural Engineer	Present – July 2017	• Preparation of structural designs for residential buildings. • High competence in AutoCAD to prepare structural dr • Competent in SpaceGass and ETAB. • Knowledge in steel, timer and reinforced concrete stru • Construction monitoring, site inspections and report m • Damage assessment and report writing. • Shallow soil investigation tests (scalar penetrometer and report making. • High-level proficiency in all NZ standards and MBIE g

2.	ALBA Civil Engineering Associates, India	Junior Structural Engineer	End date: November 2015 Start date: April 2014	• Structural Designs for houses and multi-storey buildin • Construction monitoring, supervising and planning. • Quantity and Land surveying. • 2D and 3D structural Drafting. • House Checks and Report Writings. • Material management.

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, and 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 Asse invo Wha outc
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?**	
Nov 2017	200	Training	Structural Design Training	Took an in-depth training on the Structural Design concepts and it helped me in improving my Civil & Structural Engineering concepts.	Cou Com Cert
June 2017	40	Training	Overall Productivity Improvement workshop	Completed training workshop on improving the overall productivity.	Cou Com Cert
February 2015	40	Training	Course on AUTOCAD	I learnt an in-depth analysis on the designing using AUTOCAD software tool.	Cou Com Cert
2016	120	Course	Project Management	Completed Graduate Diploma Course in Project Management.	Cou Com Cert

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:
IPENZ National Office,
Level Three
50 Customhouse Quay
Wellington 6144,
New Zealand

Postal Address:
IPENZ National Office
PO Box 12-241
Wellington 6144
New Zealand

Appendix One

COMPLEXITY DEFINITIONS

COMPLEX ENGINEERING PROBLEMS

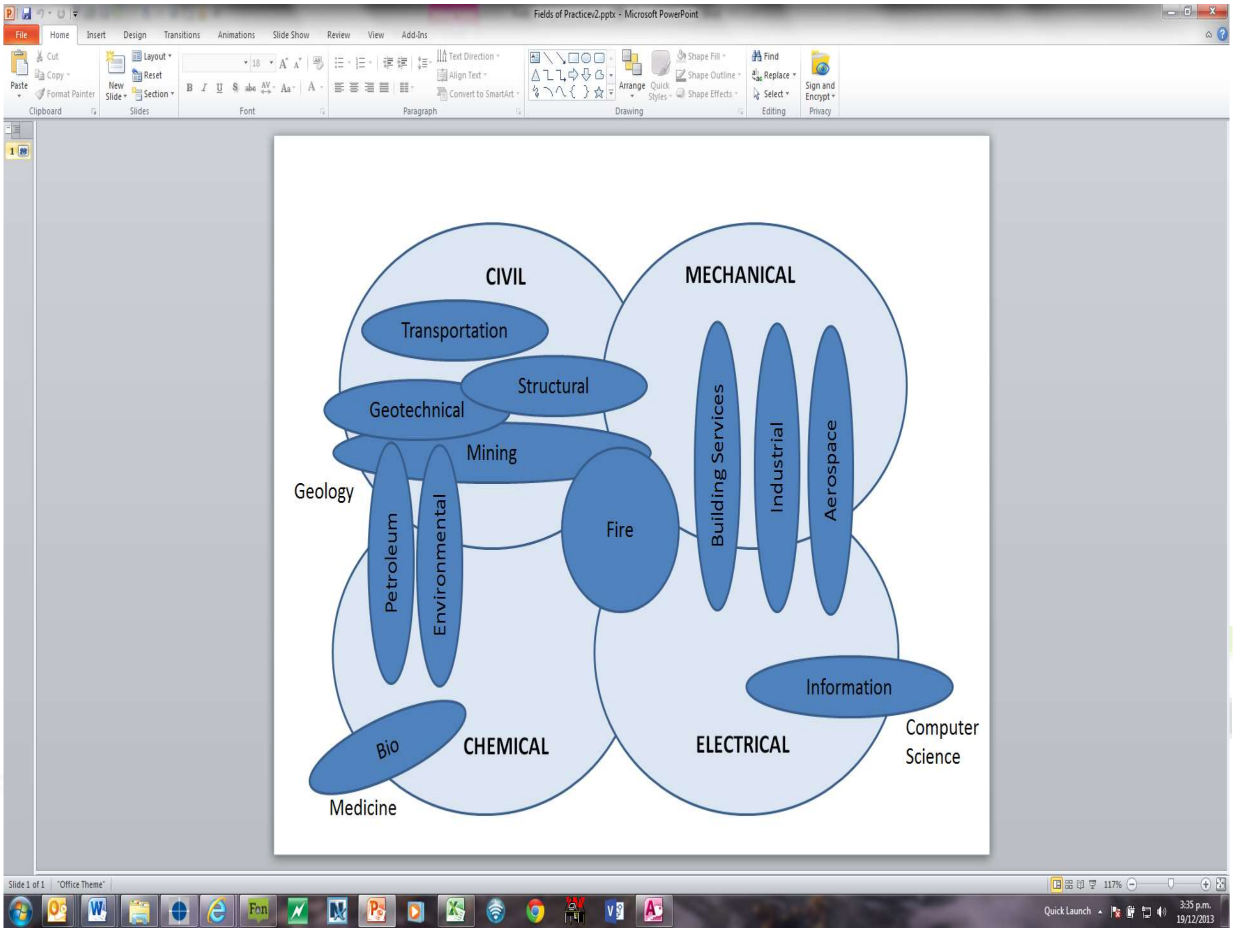
Complex engineering problems have some or all of the following characteristics:

- 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.