Professional Development Program

CAREER EPISODE REPORT (CER)

EXAMPLE REGISTRY

PDP your pathway to Chartered Status

ENGINEERS AUSTRALIA
Professional Development Program

Engineers Australia expresses our sincere thanks to those who have provided their CERs to be used as the basis of this work solely for the assistance of others aspiring to Chartered Status.

Due to privacy and commerical in confidence considerations, consent has been obtained from the original authors of each Career Episode Report (CER) used herein.

All CERs in this document have been edited to ensure anonymity of people, organisations, projects and places etc.

Please direct any queries regarding this work to PDP Administation at pdpadmin@engineersaustralia.org.au

Further information on Chartered Status is available at www.engineersaustralia.org.au

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Career Episode Record	COMPETENCIES COVERED	Discipline								Industry Sector																	
		CIVIL	STRUCTURAL	ELECTRICAL	IT & ELECTRONIC	CHEMICAL	MECHANICAL	BIOMEDICAL	ENVIRONMENTAL	ACADEMIA	AEROSPACE	BUILDING SERVICES	COMMUNICATIONS	COMPUTER SYSTEMS	CONSTRUCTION	CONSULTING	DEFENCE	ELECTRONICS	ENERGY	MANUFACTURING	MARITIME	MINING	OIL & GAS	RESOURCES	RAIL	SOFTWARE/IT	WATER
Flare Knock Out Drum Level	C2.2, C2.5			√	√														√				√	√			
Fuel Oil to Distillate Conversion Engineering Study	E4B1, E4B.2, E4B.3, E4B.4					√	√												√				√	√			
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Root Cause Failure Analysis of JJ100 Crude Charge Pump Motor	E4B.1, E4B.2, E4B.3, E4B.4			√															√				√	√			
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Introduction

A Career Episode Report (CER) is a documentation of your professional experience.

A CER indicates the attainment of experience relating to relevant Elements of Competency as outlined in the Chartered Status Applicants Handbook available on the Engineers Australia website.

This document is a compilation of CERs from a variety of engineering disciplines, industry sectors and occupational categories.

Please note that this document is for generic reference only. It is intended to give Chartered Status applicants an overview of the type and style of documentation required and is not to be used as a mechanism of comparison or moderation against other reports.

The significance of individual career episodes varies. A minor career episode may cover a relatively short period of time (several months) and be submitted to claim some Elements of Competency. A major career episode (a large or lengthy project for example) can be submitted to demonstrate an entire Unit of Competency.

Each CER should emphasise problems identified and the problem solving techniques you utilised in overcoming them. It should be prepared in narrative form, using the first person singular and should describe the specific contributions you have made.

CERs should emphasise:

- your personal contributions and responsibilities;
- the problems you faced;
- the solutions you found;
- the engineering judgments you made; and
- the impact your solutions and judgments generated.

In order to access the continuous assessment option, Professional Development Program (PDP) participants must write their CERs using Engineers Australia's online CER writing facility, ePDP.

CER Verification Standard

Although not included at the end of the sample CERs in this document, it is imperative that all CERs include a verification section as per the example below.

Signature of Candidate:
Candidate's Verifier/s Details
Name:
Phone/email:
Position:
Relationship to Candidate:
Engineering Qualifications: (or Engineers Australia Membership Number)
I verify that the above narrative is a true account of the candidates own work Signature:

Flare Knock Out Drum Level 02/02/2004 - 08/08/2004	Competency Element Claimed
A flare knock out drum is a vessel which exists immediately upstream of the flare. The drum provides a volume and hence an amount of residence time allowing any liquid carried over from the process into the flare system to be pumped away. This prevents liquid from being sent up the flare, which once alight has the potential to cause grass fires and dangers to personnel. High level alarming in the flare knock out drum is particularly critical as it alerts operations staff to the possibility of this event occurring.	Introduction
Significant corrosion on the standpipe nozzles, as well as unrevealed failures of the discrete high level and low level switches (due to clogging of small 1/2" nozzles) necessitated the investigation into reliable high and low level alarming. From a mechanical point of view, I determined a requirement to simplify the instrument bridle arrangement to prevent corrosion. From an instrumentation perspective, I identified a requirement for a means for more reliable measurement. Problems with this service included varying composition and density. The possibility of high H2S within the drum also makes cleaning of the nozzles possibly dangerous to personnel, and is traditionally done using breathing apparatus. I identified that a significant increase in process connection/nozzle size to prevent clogging and remove the above cleaning risks would be required. However, replacing like for like even with larger nozzles would have the corrosion eventually recur. The use of discrete switches of any variety would still mean that failures would be unrevealed and so I did not consider the use of these further. Instead I proposed the use of a continuous instrument having the alarms set at the control system to mitigate this. I investigated the use of a differential pressure (DP) instrument and also guided (contact) radar and horn (non-contact) radar. The wide changes in density ruled out the DP transmitter. The refinery had little experience with level radar on such a service, but I had confidence that this technology would be most appropriate. The vendor advised that guided radar would be preferable to non-contact, due to better performance on liquids with low dielectric values. I had concerns with any system that would have contact with a possibly viscous and unforgiving medium and so I sought advice from our senior instrument/electrical engineer, and I discovered that the liquid components with low dielectric (such as LPG) would most likely have flashed off at this point, due to the temperature in the system. Based on this I proposed the non-contact solution and used this opportunity to trial a vendor who was not on our recommended vendor list. Once I had considered all the options, and come up with a design satisfying the engineering problem, I put this forward at a formal design review, where all disciplines and operations staff are made aware of the motivation, alternatives and proposed solutions.	C2.2 Prepares concept proposal and seeks advice on latest technology

Flare Knock Out Drum Level 02/02/2004 - 08/08/2004	Competency Element Claimed
Prior to the formal design review, I marked up a Process and Instrumentation Diagram (P+ID) and had it drafted and put into the system as a project P+ID. This allowed the proposed change to be captured within the document management system and made others aware of the proposed change (prior to implementation). During the design review and subsequent alarm review I made changes to this project P+ID and ensured that these were drafted and captured in the system. As this design required commissioning of a new analog loop and demolition of two existing digital loops, the appropriate suite of documentation needed to be updated. Appropriate Input/Output (I/O) and cores were identified by myself and reserved. At this point, I made markups to the loops and associated junction box drawings needing demolition. For the new analog loop, I created a new loop drawing based on a standard drawing and marked up the appropriate junction box drawings. In addition, an instrument data sheet and entry into hazardous area register were created. I then had these drawings drafted, captured within the system and approved for construction. Once this was done, work packs for the installation work were created by myself and issued to the contractor. During installation, a conflicting need for I/O from a different project required the design to be altered to use a different analog input point. Although the changes were minimal, I made the appropriate change to the drawings, had them drafted and reissued the drawings and affected work pack jobcards to the contractor. Once work and the punch listing were completed, the project P+ID was merged into the system as the current and approved P+ID.	C2.5 Prepares and maintains documentation during the design process
During construction and commissioning as builts were created, and integrated into the system during the closeout phase of the project. The modification was successfully commissioned and had been working as described for a number of months at the time of writing.	Conclusion

Fuel Oil to Distillate Conversion Engineering Study 1/12/2004 – 30/04/2005	Competency Element Claimed
The fuel oil to distillate conversion engineering study was undertaken to provide a scope of what infrastructure and plant equipment modification is required in order to convert the backup fuel system at a refinery from fuel oil to distillate. A senior engineer and I worked together to complete this study.	Introduction
A project kick off meeting was held with the stakeholder where the project's brief and deliverables were issued. I discussed the exact requirements in detail with the stakeholders and agreed on the acceptance criteria for the study. Following the meeting, the senior engineer and I conducted a stakeholder's analysis to identify possible sources of information to assist in the study. Due to the size of the study, the tasks were divided between the two of us. For my section, I mapped out all the items needing to be investigated and set a target date for completion against each of the items. I examined each deliverable in detail and listed sub tasks for action. Following that, I made an estimate of the time and resources required for each of the identified sub tasks. The fuel oil to distillate conversion required modification to the calciner and powerhouse boilers burner management system, as well as other instrumentation and electrical modification. I wrote up a list of deliverables and made a request in writing to the lead electrical engineer for the assistance of an electrical engineer in the study.	E4B.1 Responds to/ Identifies Problems
I scheduled a fortnightly meeting to review our progress and discuss any issues. A progress update meeting with the stakeholders was conducted monthly to evaluate the project's progress and direction. The calciners had gas burners installed and swappable with fuel oil burners if required, while the powerhouse had only fuel oil burners installed with gas ignition systems. Both the existing systems required an upgrade because of non compliance with current safety standards and the risk posed to operators. I was involved in seeking out prospective burner vendors that could deliver the requirements of the stakeholders. The selection process for vendors was done in conjunction with the stakeholders. Preliminary engineering for the burner was done in collaboration by the vendor and I. Several burner options with different configurations were proposed to the stakeholders, taking into account environmental emissions, costs, safety equipment compatibility and operability.	E4B.2 Plans the investigation
For the tasks of upgrading fuel supply piping systems in the refinery, I analysed the current situation and identified any improvements or modifications required to accommodate the proposed distillate system. Bearing in mind that the fuel oil system still needs to be in service while the conversion is taking place. To begin the investigation, I compiled a list of Piping and Instrumentation Diagrams (P+ID) P&ID for the fuel supply system and began marking any required modifications/ demolitions. These drawings were then passed on to the senior engineer for estimation and isometric sketching. Following that, I created a detailed piping demolition list and a modification list. For operational security and insurance purposes, the existing fuel oil system has to remain functioning and in service while the distillate conversion is taking place. I identified several options for installation tie in and a temporary fuel supply system for the powerhouse and calciner as a result of consultation with the stakeholders	E4B.3 Carries out the investigation

Fuel Oil to Distillate Conversion Engineering Study 1/12/2004 – 30/04/2005	Competency Element Claimed
and the senior. These options were costed and included in the report. The logistics of fuel supply to the refinery involved the analysis of the current fuel supply system available to the refinery and fuel supply to various facilities in the refinery itself. I consulted the fuel supplier and the logistics department to determine the current fuel consumption and supply method to the refinery. Based on the distillate consumption of the new burners, as per vendor data, the estimated monthly distillate requirement was determined. Because the new distillate requirement was much higher due to the elimination of fuel oil, I researched and proposed the option of increased distillate trucking frequency or supply of the distillate by rail. The stakeholders preferred the former option, as the current rail logistics were fully dedicated to alumina transfer to port and could not accommodate distillate transfer. Moreover, additional infrastructure would have to have been installed to facilitate the rail transfer option. On the bulk fuel storage tanks modification, I referred to the relevant Australian Standards. I listed all the improvements required to make the bulk storage area compatible to the current standards. I then conducted some preliminary design work for improving the area and obtained budget costings from on site contractors.	
Once the scope of the project was finalised and the senior engineer and I packaged our individual sections into various discipline work packs for ease of detail design and construction. I compiled the project cost estimate (+/- 35%) and completed cash flow forecast, taking into consideration inflation, component price increases, and wage increases. These estimates were later reviewed by in house estimators. The report writing process began approx. halfway through the investigation phase. Initially, I included information and results from my investigations and research. Later, the report was consolidated with findings from the senior engineer. The burner conversion proposals from two boiler and combustion industry service providers were also consolidated into the report. I spent the last few weeks of the study reviewing and refining the report with assistance from the senior engineer. The report was also sent to the stakeholders for review and to ensure that all deliverables are met. The findings from the study were presented to the stakeholders and other refinery representatives. Recommendations arising from the study and their justification were made known to the stakeholders. This study provided the stakeholders with an idea of the cost of converting from fuel oil to distillate. The results of this study concluded that the proposed fuel oil to distillate conversion should be progressed into the feasibility stage, but more emphasis should be placed on the commercial and risk mitigation strategy by the refinery's upper management. After the presentation, the report was finalised and circulated to stakeholders for their signatures.	E4B.4 Draws Conclusion and makes recommendation

Project X 16/02/04 – 07/10/04	Competency Element Claimed
This project consisted of the construction of a new medium rise building in a major capital city. Our office was commissioned by the head office to complete several complicated elements of the structure. My role in this project was to complete the majority of the detailed design of the complex suspended ground floor slab.	Introduction
After being briefed on the project by the chief project engineer, my first task was to break down the entire floor system into an ordered set of discrete designable elements such as slabs, bands and transfer beams. Next I used the RAPT computer program to carry out the detailed design of each of the forty or so elements. This involved measuring the span, dimensions and loading on each element and entering this data to model it in the program. My aim was to make the models as accurate as practicable, while still allowing for the opportunity to incorporate future changes. After re assessing the specified design criteria, I realised that the reinforcement cover I had used did not satisfy fire resistance and durability requirements. Luckily, because each design element was already set up as a computer model, it was simple enough to change the covers and make the necessary design modifications. To ensure the clarity of the design to others, I documented and ordered the calculations and computer output in a lever arch file, including summary pages and assumptions used.	C2.3 Implements Planning and Design Process
Throughout the design process, it was my responsibility to produce, order and maintain all the design documentation including computations and reinforcement drawings. I arranged the calculations, numbering approximately 1000 pages, based on the site grid system. The RAPT output for each element designed was sorted in this system, with summary pages of input and conclusions provided for each. I clearly outlined content pages and the design concepts and philosophies at the front of the documentation, while also including sections for superseded computations and verification documentation. It was also my task to draw up and update the reinforcement drawings. I produced a sample markup which was checked by the chief project engineer and the clients to ensure an acceptable format for the rest of the drawings. After we issued this sample markup, the chief project engineer went on several weeks holiday, which left me with the task of managing the timing and production of the rest of these drawings, with minimal supervision from the department manager. Using the original design computations as my basis, I drew up all the detailed reinforcement plans. This approach allowed me to check and verify the computations as I went, and update the drawings accordingly. Altered drawings were revised and re-issued as a next revision, in many cases with copies of relevant calculations to show reasoning. During this time the rest of my workload was light so, apart from one or two difficult areas, I took the chance to push the drawings ahead and have the first revisions largely ready before time. Whilst in the middle of this process, the client advised us that the pile capping drawings needed to be issued earlier than anticipated, so I diverted more of my time and resources to this task in order to get the drawings and documentation ready by the deadline. Key documentation met this deadline, with supporting section drawings being delivered a few days later.	C2.5 Prepares and Maintains Documentation Through the Design Process

Project X 16/02/04 – 07/10/04	Competency Element Claimed
The client was concerned about the deflection under load of the suspended ground floor slab. I discussed my computer model results with the client and demonstrated that the design case deflections were acceptable. I also showed that changing the design to provide less deflection would significantly increase construction costs. Another engineer completed an independent verification of the ground floor structure. I then went through and addressed all the issues raised, making changes where necessary. The head office also reviewed and directed many queries to our chief project engineer. I was then given the task of reviewing and addressing many of these issues and providing responses. The reviewed design was provided to the client who advised that the design brief had been met.	C2.4 Reviews the Design to Achieve Acceptance
By coincidence, a couple of months later I was on holiday in this capital city and I used this opportunity to contact the head office and organise a site visit with one of their engineers. At the time they were constructing the basement and foundations, so not much of my design had been built yet. However the experience was still very valuable to see the site and discuss my designs with the site engineer to unearth any problems and methods he believed things could have been done better.	Conclusion

Low Frequency Analysing and Recording Program 01/09/2003 - 05/03/2004	Competency Element Claimed
This project consisted of upgrading the Low Frequency Analysing and Recording (LOFAR) display program, currently used for underwater sound analysis. It was my core responsibility to design a spectral analysis program for filtering the beam spectral plots of passive signals received from the hydrophones. I was also required to design an interface to display the spectral content of the received signals in time, frequency and intensity (in decibels).	Introduction
After viewing the old LOFAR program and talking to users, I deduced the key requirement included design of a real time data analysing program with a friendly Graphical User Interface (GUI). This required using an improved data acquisition process and thus new data acquisition cards were necessary. I then optimised minor features of the software program needed for the new software program to be considered an upgrade. Features were: to have selectable baseband frequencies; continuously updating date and time display; print current screen function and also a 'smart-cursor' to read the current details on the graph. The client outlined additional desirable features including the option to save a picture to file (displaying the file name), title and time of the display and a time setting function.	C2.1 Interprets and scopes design requirements
Initially, I developed a simple prototype program to take external data and display this on a time, frequency and intensity graph. I then determined the software code for displaying the date the program was opened and configured the code to continuously update the time display. With the help of my supervisor, we developed the smart mouse, containing code to display the frequency, time and dB coordinates. I then addressed the other requirements, until the complete software program represented user requirements.	C2.3 Implements planning and design process
This preliminary software was then installed in the system containing the upgraded data acquisition cards and the software program vigorously tested. During the testing stage, the program generated a number of significant errors. For example, the auto memory of the Data Acquisition modules (DAQ) causing the program to crash every few hours; and the save option automatically saved the screen in MATLAB format and not as a picture (.jpeg or .gif). I investigated code for storing picture format profiles automatically, remembering that MATLAB stores all information. I recommended we determine code that would erase the program's memory at set intervals. These improvements were made and the software program installed in the system containing the hydrophones. The users then critically reviewed the whole system and suggested improvements to user friendliness, such as a changeable bandwidth and allowing the auto print button to print landscape instead of portrait format. Once I made the modifications the system was accepted.	C2.4 Reviews the design to achieve acceptance
I began this project by defining the capability needed, performing planning and minor tests in the design stage and finally design review, installation and system acceptance. This project was a success and delivered on time, on budget exactly reflecting what the user desired to do their job in an accurate and and professional manner.	Conclusion

Working with Technical Change Using CITRIX 08/03/2004 - 31/08/2004	Competency Element Claimed
My engineering rotation included planning, researching, implementing, managing and recommending improvements involving technical change. This project details a software system titled CITRIX and thin client hardware. The CITRIX system provided remote access to individual desktop computers, regardless of the operating system. Thin client computers use remote terminals to access information from a server to save local memory space.	Introduction
I participated in the planning stage for the test laboratory redevelopment. The laboratory was challenged by size restrictions due to the increasing number of computers required. I provided ideas and research to introduce technical changes. We then identified possible opportunities for the laboratory and I designed the 'new and improved' laboratory layout, incorporating the new technology. I also spoke with nearby personnel about the introduction of technical change to improve the working envionment as well as the achievement of business objectives.	E7.1 Participates in planning the introduction of technical change
I then researched possible design concepts to include supportability, sustainability and interoperability. This investigation and analysis covered several design options and concepts. Focusing on design requirements, I discovered an innovative solution incorporating the latest technology and open systems engineering (compatible with many types of computers) . On advice from my engineering supervisor, technicians and other engineers, I prepared a concept proposal offering a possible design solution using CITRIX - a new software program called that could be run with thin client technology. Collaboration with Citrix's manufacturer allowed me to download a sample program to test functionality. Discussions with the company's Defence clients allowed me to overcome setup and technical hurdles. After planning the introduction of technical change, investigating and analysing possible design options, CITRIX and thin clients were chosen as the design outcome.	E7.2 Develops technically creative and flexible approaches and solutions
On implementation of technical analysis and design, the concept proposal required management. Management of this proposal required me to source other technical reviews regarding CITRIX and the new equipment. On reviewing the relevant information, I identified the IT standards addressed by the new technology and ensured the new concept abided by Defence standards and processes. Furthermore, given I had to work with a trial version of the CITRIX software, I then had to manage the transition to a full commercial license version. A report documenting the design process, testing and outcomes was compiled. Information and outcomes were then analysed by all stakeholders concluding with the permanent installation of CITRIX with new technology.	C3.6 Manages Information
This project shows how the laboratory and staff responded to changing technical requirements. These technical changes were driven by customer need and re-enforced by stakeholder demand. Throughout this technical change, I informed the section, stakeholders and customers of implementation progress and recommended technical improvements to the project manager. For example, I suggested that planning for continuous, long-term incremental changes would help personnel cope with workload increases and that changes can be time consuming to implement and this should be factored into the timeline.	E7.3 Manages emerging technical challenges and opportunities Conclusion

Root Cause Failure Analysis of JJ100 Crude Charge 10/04/2004 - 29/06/2004	Competency Element Claimed
Five crude charge pumps with electric drivers supply feed to a refinery's Crude Distillation Units (CDU 1 and CDU 2). JJ100 is typically used to exclusively feed CDU2.	Introduction
Two successive bearing failures on JJ100, the second a week after repair, resulted in catastrophic winding damage and motivated the need to perform a Root Cause Failure Analysis (RCFA). I was intimately involved in managing the whole RCFA process. A multidisciplinary RFCA team was assembled and led by our onsite RCFA expert. This included representatives from onsite maintenance teams and the motor repairer. During this session, an ordered approach was used to locate every possible cause of failure. Minutes from the RCFA meeting were documented, and the actions were allocated to the appropriate disciplines and parties including: the rotating machinery team, the motor repairer, the motor manufacturer, electrical maintenance technicians, and operations staff form the electrical department. I was allocated the responsibility of planning the majority of the investigation tasks as well as monitoring the progress and managing the completion of actions by the other parties. Given the previous catastrophic failure it was agreed between myself, the rotating equipment department and operations that the root cause analysis process and reporting would have to be completed prior to re-commissioning of the motor. This step would be essential in planning the tasks.	E4B.1 Responds to/ Identifies Problems
To begin, a skeleton plan for each task was created and I identified the most time intensive tasks (i.e. communication with manufacturer in Finland), as well as the tasks that needed to be coordinated with the various stages of repair. At this stage various parties, particularly the motor repairer were involved closely to ensure that both the schedules of the analysis and the repair would not clash. From this point, I was able to set deadlines for the completion of actions, which I communicated to the various parties. For each of the skeleton plans, both myself and the Rotating Machinery Engineer devised the proposed testing regimes and equipment that would be required. At this point, since mechanical clearances and their measurement predominated, I became familiar with the mechanical arrangement of the motor and also in the use of dial gauges to determine clearance measurements. In some cases I devised methods in which unobtainable clearance measurements were made inferentially. Many of the skeleton plans required additional research (for instance I investigated bearing failures modes and lubrication extensively) in order to be able to make judgment on such root causes. Additionally particular consideration was given to the capabilities and availability of the onsite technicians (particularly since the refinery was in a scheduled	E4B.2 Plans the investigation

Root Cause Failure Analysis of JJ100 Crude Charge 10/04/2004 - 29/06/2004	Competency Element Claimed
maintenance shutdown at the time).This was achieved by close involvement with the electrical and mechanical forepersons.	
In many cases during the process, the proposed investigations did not yield the required information, and as such I refined the procedures and had the individual investigations redone until the required result was achieved. For many of the individual investigations, particularly in the case of the Variable Speed Drive, extreme care was taken to ensure that the safety risks and dangers were communicated and mitigated. To do this I produced detailed test procedures/ workpacks. During the process I made myself available to witness particular activities in order to ensure a level of independent assurance that the correct information was being discovered. When all the tasks in the investigation were complete, I revisited each root cause item separately, and was able to identify as a first pass which items were not contributing causes to the failure. For each the contributing causes, each of these was considered in detail for the severity of the contribution of the failure and ranked. In this particular case, axial clearance issues due to an incorrect initial repair proved to rank much higher than the other causes. This was deemed to be the root cause of the failure. Contributing causes however were not dismissed.	E4B.3 Carries out the investigation
From this analysis, I wrote a summary report detailing the investigation, root and contributing causes and proposed a number of recommendations to prevent such a failure from occurring in the future. Prior to issuing this report internally and externally, I sought feedback from the original RCFA team. From this it was determined that although I had captured the root cause sufficiently, I had not communicated the importance of some of the contributing causes - the report was then amended and reissued. Recommendations from the report were then enacted on for both the installation and recommissioning of the motor. In addition to this, witnessing of various stages of the repair of the motor allowed me to be confident that the root cause of failure would not be present in this repair. Close monitoring of winding temperatures was done by myself for the first week of operation, and when they were deemed to be within an acceptable range for the entire week, the motor was handed back to operations. The motor has been working without issue for the past 8 months.	E4B.4 Draws conclusions and makes recommendations

Australian Onshore Enhanced Oil Recovery Commissioning 01/05/2008 - 18/08/2008	Competency Element Claimed
During my role as a commissioning engineer with an oil and gas exploration and production company, I was responsible for commissioning an Australian onshore Enhanced Oil Recovery (EOR) Project. The project involved redirecting raw gas from a production gathering facility into the onshore oil field situated in a remote basin. The process involved the installation of a gas dehydration unit, a high pressure reciprocating compressor with a gas engine, modifications to the existing facilities at the production gathering facility, a 16.5 km 4" high pressure injection pipeline and both facility and subsurface modifications to convert two existing production wells to injectors. My duties included preparing commissioning procedures, punch listing, pre-commissioning checks, commissioning, assisting the Lead Commissioning Engineer, managing representatives from a variety of equipment vendors, preparing operating procedures and handing over the commissioned project to operations. The project cost ~$22 million and over time it is expected that it will increase oil recovery of the field by nearly one million barrels.	Introduction
At the beginning of this role I was office based and responsible for preparing commissioning procedures for the project. These procedures gave an overview of the project, shutdown requirements, schedule, roles and responsibilities, a detailed description of modified or new facilities, pre-commissioning checklists, commissioning checklists and final equipment performance tests. The primary purpose of the commissioning procedure was to ensure the safe introduction of hydrocarbons into the new facility and then to verify that all new equipment was working as per its intended design and the goals of the project were achieved. For example, it was required to check that when the new compressor was running it would stop on various emergency shutdown (ESD) or unit shutdown (USD) inputs. One of the USD inputs was a low temperate alarm on the existing flare header that could be caused by high pressure gas passing from a closed valve into the flare header causing temperatures below the minimum rating of the carbon steel flare header. I developed a test for this that required the compressor to be running and an instrument technician forcing a signal of -29 Deg C from the temperature transmitter on the flare header. On site I witnessed this test as the compressor shutdown when the low temperature alarm set point was reached. Throughout the commissioning process I encountered a number of occasions where equipment was not working correctly. For example there was a high level switch and an independent level transmitter attached to a vessel on the dehydration skid. The transmitter was of a float type and upon sensing a high level it would tell the level control valve (LCV) to open so as to drain liquid from the vessel. During initial startup the dehydration unit kept tripping on high level, however the level transmitter showed a level much less than the trip point. I then investigated this problem by opening the level transmitter chamber where I observed that liquid hydrocarbons were forming an interface with the water and noticed that the level transmitter was calibrated with a standard gravity (SG) of 0.95. This led me to conclude that the float was simply tracking the interface level due to the SG being set for water, whereas in operation we were getting liquid hydrocarbons in the vessel with an SG of ~0.7. Hence the level transmitter was not sensing a true level, therefore did not tell the LCV to open and the unit then tripped on high level. I shared this finding with	C2.6 Validates design

Australian Onshore Enhanced Oil Recovery Commissioning 01/05/2008 - 18/08/2008	Competency Element Claimed
operations and instructed them to manually drain this vessel twice a day and also recommended to the project design team that a lighter float be installed. When all the modified or new facilities were individually commissioned, I made final checks to ensure that gas was being directed from the production gathering facility, through the dehydration unit and dried to a dew point of less than -30 Deg C, sent through the compressor were pressure was increased as per design, then directed to the new EOR pipeline where gas flow was spilt evenly between the two injection wells. These checks where made by setting up trends on the plant FIX screen, physically recording details from field instruments and relaying over radio to the control room, verifying reliable equipment performance with vendor representatives and involving field personnel with all the above and ensure a smooth handover to operations post commissioning.	
In order to understand all parts of the project I liaised with engineers (from a variety of disciplines) that were responsible for the design of the new facilities. For example, from the lead process engineer, I obtained information on flow paths, pressures, temperatures, pressure relief and general operational guidelines. From the lead instrumentation engineer, I requested datasheets for all new instruments, an overview of the control systems and integration to the existing production gathering facility plant Process Logic Control (PLC) and from the lead mechanical engineer, I ensured that all new pressure vessels had been registered and released for service by the vessel inspector, all new piping had correct hydro-test and non-destructive testing (NDT) - as per code requirements - along with reviewing datasheets for all new mechanical equipment. This also helped me determine the vendor representatives we would require and their scope of work, which I fed back to the planning engineer in order to allocate sufficient funds for these commissioning requirements. In parallel to this I made a number of site visits during construction to discuss the project with operations. During one of these visits, I walked over the new facilities with the area operator and the maintenance supervisor to ensure that all new manual valves were accessible, all new equipment was able to be safely isolated from existing plant and in general ensure that the project met the end users requirements and that any problems could be identified then and rectified during the final stages of construction. For example, within the production gathering facility satellite the maintenance supervisor commented that there was no manual drain valve on the compressor engine oil cooler, hence when the machine was isolated, fitters would have to crack a plug to drain it and risk spraying hot oil in an uncontrolled manner. At an injection well the area operator queried the pipe support design as some high pressure piping appeared loose and was free to move. I overcame these problems by requesting the compressor engine vendor to install a manual drain valve on the oil cooler and feeding back to the injection well design team with subsequent installation of new pipe supports respectively. In doing this I considered the project post commissioning in its operational phase and helped ensure a smooth handover to operations allowing a successful start up and continuous running of the EOR scheme, so as to meet the company's financial goals of the project.	E2.1 Plans operations and systems

Australian Onshore Enhanced Oil Recovery Commissioning 01/05/2008 - 18/08/2008	Competency Element Claimed
During commissioning it became apparent that the compressor and dehydration unit would not start. This appeared to be a design oversight as the compressor required a 'gas dew point healthy' signal to start (healthy dew point achieved by an operational dehydration unit drying gas inlet to compressor) whereas the dehydration unit required a 'compressor running' signal to start. Hence, initially, in order to start up the new equipment I instructed our site based instrument electrical / PLC engineer to bypass these alarms in the PLC to allow us to start up machinery for commissioning purposes. However in order for operations to start the new machinery without having to manually bypass safety systems or make complicated PLC changes - I requested a 'start up bypass' be built into the FIX screen. This would allow operations to simply press this button, ensuring that the required changes for startup were made in the PLC, behind the scenes, however all changes would revert back to normal after 2 hours. This helped optimise the flexibility and production of the new project by ensuring easier, faster and safer start up of the new equipment.	
To commission the new equipment we required a number of vendor representatives to be on site. These included representatives from the compressor packager, the dehydration unit packager and their electrical PLC subcontractor for the ESD PLC modifications and a consulting engineering firm for integration into the production gathering facility PLC, FIX screen updating and overall IE support and control of the new equipment. In addition to the vendor representatives, construction and operations personnel were also required for punch listing, pre-commissioning checks, commissioning and troubleshooting. Given the large number of persons involved and the need to perform commissioning work in an existing live plant, I arranged for daily meetings to discuss the previous day's progress, the plan for the current day, the plan going forward and any issues that were causing delays. By collaborating with all the interested parties in this way I helped guide the work teams to optimise the commissioning schedule. In addition to providing guidance on activities, I also advised all work parties new to the area regarding my company's occupational, health and safety practices. For example, the representatives from the dehydration unit had not previously worked in the geographical area nor were familiar with the additional safety requirements of working in a live gas plant. With this in mind and prior to their arrival on site, I advised them how to do the company inductions online, the dangers of 'heat stress' when working in a hot arid environment, baggage restrictions and the need for continuous gas monitoring whilst performing work under a permit at our facility. Upon their arrival at site, I arranged for a site specific induction, ensured they had the correct PPE, arranged for additional PPE where required (e.g. hard hat) and checked their identification cards issues by my company. Whilst the vendor representatives were working, I monitored their individual performance by asking them questions on particular aspects of their equipment, discussing how they would overcome a particular problem, whether they had encountered this problem before, what other projects they had worked on previously and what formal qualifications they had. By doing this I also satisfied myself that the work group was competent and performing as per the project's expectations.	E2.4 Manages people

Australian Onshore Enhanced Oil Recovery Commissioning 01/05/2008 - 18/08/2008

Competency Element Claimed

Toward the end of the design phase draft operational procedures were prepared by an engineering consultant. These procedures were written in a generic way and based upon my experiences in commissioning the new equipment and overcoming the difficulties encountered. I revised all 21 operational procedures and updated the production gathering facility satellite operator manual accordingly. By providing these revised plant operating procedures, I helped ensure that operations personnel responsible for the new facility post commissioning were adequately trained in its operation. In addition to this, wherever possible, I involved operations personnel during the commissioning process to allow them to gain familiarity with the new equipment. For example, I arranged for an IE tech from my company to perform Critical Function Tests (CFTs) of new instrumentation and I helped the area operator isolate the new compressor for the first time.

Investigation into Production Loss and Environmental Incident 17/12/2007 - 18/01/2008	Competency Element Claimed
In my role as area electrical engineer with a mining, smelting and metal production company, I was required to undertake a number of investigations into significant equipment failures. This report details one such investigation. In this investigation I was asked to investigate the cause and effects of a localised power failure and report on the findings of the investigation to the site's engineering and production management teams.	Introduction
I received an initial briefing from the production manager that suggested an electrical fault had caused a loss in the supply of power to a motor control centre (MCC). It was claimed that the power failure was responsible for a number of tanks spilling into bunded areas below. These overflows were recorded as environmental incidents by the refinery and were considered serious in nature. I saw this as an opportunity to apply a logical methodology to investigate the cause of a plant failure. The production supervisor agreed and was happy for me to develop a list of corrective actions to assist operations personnel in preventing a similar incident from recurring. Acting on behalf of my employer, I was required to follow the appropriate Equipment Failure and Flow Loss Reconciliation System (EFFLRS) procedure. These procedures involved the implementation of a Root Cause Analysis (RCA). As evidence became known and my familiarity with the problem grew, I had to redefine the focus of the investigation. Although the RCA was initially focused on the power failure itself, the final RCA suggested that the power failure was merely one event in a chain of events contributing to the recorded overflows. After receiving the initial briefing from the production manager, I compiled a list of personnel and other potential knowledge resources to assist me with the investigation. I called an initial kick-off meeting with these stakeholders. This team consisted of both technical and maintenance personnel. Such personnel included the area chemical engineer, electrical foreman, electrical reliability engineer and maintenance foreman. Together these people were able to provide me with a number of events that may have contributed to the final overflows. I used these suggestions to provide me with a list of likely causes and then gauge and define the scope of the investigation. At the conclusion of the kick-off meeting, I made it clear that I intended to thoroughly investigate the problem and to use all evidence available to me to ensure the findings of the investigation were accurate and helpful to both the engineering and production teams. I later compiled minutes for the meeting and forwarded these to all attendees and other stakeholders including the maintenance and production supervisors.	E4B.1 Responds to / Identifies problems
As the sole investigator, I was responsible for planning the investigation, acting as liaison between stakeholders and coordinating the collection of evidence. The	E4B.2 Plans the investigation

Investigation into Production Loss and Environmental Incident 17/12/2007 - 18/01/2008	Competency Element Claimed
collection of evidence required interaction with various stakeholders to assess their understanding of the series of events and to gain access to the evidence required to support any findings arising from the investigations. The process for a RCA investigation was well documented in my company's document management system. Given personnel's familiarity with this process I chose to adopt this procedure as my method of approach. This investigation was compulsory under my company's Equipment Failure and Flow Loss Reconciliation System (EFFLRS) and was required regardless of perceived cost. This policy provided the investigation with the necessary leverage to get the investigation underway. I identified the primary sustainability objective as being the identification of the root cause(s) of this environmental incident(s) to and provide information to assist in preventing future occurrences. Prior to the kick-off meeting I compiled a list of relevant personnel, knowledge and evidence sources. The list consisted of key stakeholders, each of whom held technical and operations knowledge relevant to the investigation. Evidence sources also included historical process data and environmental data such as meteorological data. I treated each resource as a potential evidence source. I also decided and noted that where inconsistencies occurred between witness statements and historical data, the historical data would take precedence. I prepared a program of activities to implement the investigation. In the kick-off meeting I summarised the RCA process and brought everyone up to date with the procedure and the various activities required to complete the investigation. I also highlighted the importance of the resulting corrective actions to those involved in the execution. With this in mind the stakeholders at the meeting agreed to accept and act on the recommended corrective actions resulting from the investigation. This commitment was recorded in the meeting minutes. Given the severity and complexity of the equipment failure, the senior reliability engineer and I agreed that I should spend 40 hours on the investigation. In reality, some technical difficulties encountered trying to access evidence saw the investigation spread over many days.	
The purpose of the investigation was clearly defined: identify the root causes of the incident enabling effective solutions to be developed and implemented to prevent a recurrence of the incident. I was initially presented with an email describing the problem, as viewed by the operations team. I often referred to this email to ensure the investigation remained aligned with the initial intentions of the customer. Where uncertainty existed in the initial briefing, further details were sought from various stakeholders.	E4B.3 Carries out the investigation

Investigation into Production Loss and Environmental Incident 17/12/2007 - 18/01/2008	Competency Element Claimed
Armed with the initial briefing and my investigation plan (including technical requirements to access knowledge/data sources), I worked backwards to determine a series of theoretically possible events that could have lead to the plant's problems. I reviewed the definition of the problem presented by the operations team. Finally, after some consultation with the production supervisor, it was agreed that the problem was the quantifiable production loss and environmental incidents. These were the events we were trying to prevent from recurring. Evidence consisted of witness statements, the operator's logbook and photographs etc. Other sources of information, only available to engineering staff, included the Process Historical Database (PHD) which collects historical data from the Data Collection System (DCS). Data was also collected from field devices. The collection of this data included the completion of a brief risk assessment and Job Safety Analysis (JSA). At all times the company's procedures and policies surrounding the use and storage of confidential process data were upheld. Having studied the data and obtained the necessary evidence, it was possible to confirm or disprove the occurrence of each theoretical event. Having confirmed each event, I identified the causes of the overflows and production losses. I tested the validity of the findings with knowledgeable stakeholders. With the RCA complete, I delegated corrective actions to a Single Point of Accountability (SPA). Before formalising these tasks, I first checked with the SPA to ensure they understood the reasoning behind the action thus increasing the chance of the corrective actions being implemented. I provided a final list of the suggested corrective actions to the production supervisor. Upon completing the investigation, I had it appraised by the senior reliability engineer. Both he and I were satisfied that I had sufficiently covered all aspects of the investigation.	
In following the Apollo Root Cause Analysis method, I considered aspects of the evidence collected throughout the investigation. Upon deriving the root causes of the problems experienced by the operations team I developed recommendations for implementation. I recorded the key recommendations into an electronic tracking system known as the EFFLRS Database. Here the corrective actions were tracked through implementation and final completion. These recommendations were based on ways to further mitigate the risk of the same series of events from recurring in the future. Upon arriving at the corrective actions, I scoped the necessary work and provided management with an estimate cost for each of the relevant corrective actions. I also arranged time to liaise with the senior reliability engineer, operations staff	E4B.4 Draws conclusions and makes recommendations

Investigation into Production Loss and Environmental Incident 17/12/2007 - 18/01/2008	Competency Element Claimed
and management to provide them each with an understanding of the anticipated effects these corrective actions would have on the plants day to day operation. For example: greater focus on thermal inspections of electrical terminals and action to repair hot joints. The findings of the Root Cause Analysis were forwarded via email to the production supervisor as well as those who attended the kick off meeting. Time was spent outlining the findings of the investigation and stressing the importance of ensuring the various corrective actions were acted upon. Upon completing the Root Cause Analysis an informal discussion was held with the senior reliability engineer and production supervisor to provide them the opportunity to offer me feedback on the proposed corrective actions and the methodologies used throughout the investigation.	

Technical Sales 01/07/2007 - 09/07/2008	Competency Element Claimed
I work for a niche maritime engineering consultancy specialising in underkeel clearance software. This system allows ports to sail ships deeper while increasing both operational flexibility and safety over their traditional procedures. My role as an engineer has afforded me the opportunity to be involved not only in technical work, but also in marketing, including business and product analysis. This CER describes some of the work in which I've been involved in this area of the organisation.	Introduction
About 12 months ago, an external consultant was engaged to assist with formalising the business strategy. As part of this process I was involved with researching potential clients. The first step in this process was determining the features of each of our products and determining the conditions in which those features provided the greatest benefit. This step was undertaken within a group dynamic. For the next step, I researched and documented ports which met the criteria previously established. Using a weighting factor to determine the extent to which each port met certain criteria, it was possible to rank prospective clients and determine the suitability to these ports of individual products from within our range. In addition to this more formal process, I kept informed of developments in ports, maritime and mining companies through both general media and specialised publications. This included announcements and changes in policy by governments and other regulatory authorities. I also attended seminars and presentations into emerging export markets. I completed a short course in shipping. Part of the reason for this was to gain a better understanding of the broader environment in which we operate. This helped to identify potential opportunities for existing products outside of our traditional clients and also to generate ideas for new products that could fit within our core competencies. Recently I visited an existing client to discuss their system. This client is also in the process of trialing another of our products. The meeting gave me the chance to highlight the potential benefits of the new product. I was also able to meet with a pilot and go on a transit with him to demonstrate the new product in real time. In this meeting, I also discussed the potential to implement the system in a new port operated by the same client. There had previously been opposition to the implementation of a system at this port but I was able to gain an understanding of what the concerns were, and present a viable solution to these. As a result, the client requested we provide a capability statement as the first step towards a trial or desk study. I was interstate recently for a work engagement. I took the opportunity to meet with a previous client who had since moved organisations. I was aware that he was heavily involved in a significant port expansion project. While he was aware of our core products, this meeting gave me the chance to present other consulting services which could be of value in his new role. The meeting resulted in the request for a proposal to conduct a study for the upcoming project.	E8.1 Identifies sales opportunities

Technical Sales 01/07/2007 - 09/07/2008	Competency Element Claimed
I again travelled interstate to train a client in the use of a newly installed system. On this visit, I was able to present to some locally based pilots (not existing clients) the latest developments in one of our new products.	
I recently managed the implementation of a new system. I was involved from the initial trial through to commissioning. Discussions with the major parties involved allowed me to present the various solutions that our system could offer to both existing issues and those anticipated in the future. These issues included draft restrictions and timing limitations for sailing multiple vessels. Through the development of the trial system, I worked closely with the client to ensure their requirements were all considered in the configuration and implementation of the system. I documented the configuration requirements and had the client sign it off to ensure that our expectations were aligned. The implementation of our system requires a major shift in thinking away from traditional planning and operational procedures. It also impacts on a number of related parties including the port, the schedulers, the pilots and the shippers (the port's clients). To manage these factors, I promoted the benefits of the system to all these groups, tailoring the presentations to their particular concerns. However, I was also careful to indicate the limitations of the system, to ensure I did not give false expectations of the achievable benefits. Throughout the process, I gained a thorough understanding of the client's operations including ship loading schedules, vessel maneuverability and pilotage. This allowed me to customise the configuration of the system to optimise the benefits for the client. During the trial I provided reports to the stakeholders highlighting the benefits that were being realised. Following the trial, I made a more formal presentation to the stakeholder summarising the gains the system had demonstrated, both financial and from a safety perspective. The client agreed to implement a system. For the implementation phase, I was responsible for training the users of the system. I conducted this in groups of 1 or 2 at a time to ensure they had ample opportunity to ask questions and gain a comprehensive understanding. The system is capable of a wide variety of applications, but as I had a good understanding of the client's operations, I was able to tailor the training specifically to the user's requirements.	E8.2 Applies product knowledge to client requirements
In support of my work discussed so far, I have prepared and presented numerous reports and presentations. These have been targeted specifically for a particular stakeholder. While my company has no internal sales staff as such, I have also prepared reports and presentations for others to present, both to prospective clients and at more general industry events. The difficulty faced here is in finding a balance between technical detail and higher level information. To achieve this, I would determine the nature of the event and the likely audience, be it general managers and CEOs or pilots, harbour masters and engineers. This would give some indication as to the level at which to pitch the presentation. On several occasions, I've been required to develop simulated systems to present	E8.3 Promotes technical capability of the product / system

Technical Sales 01/07/2007 - 09/07/2008	Competency Element Claimed
to potential clients. These are useful in giving the client an understanding of the product offering and usability. These simulated systems can be an effective tool to help the client appreciate the features and visualise the potential benefits. One such occasion occurred recently when the Australian regulatory body for shipping invited industry comment on a proposal for a change in the governance of a particularly sensitive waterway. I was involved in a team that presented the benefits our products could provide to this waterway in terms of both safety and efficiency to a representative of the regulatory body. For this presentation, I put together a simulation package of the product in use to demonstrate the technical capabilities in real time. As part of the process conducted with the external consultant mentioned earlier, I participated in the preparation of marketing documents. This involved identifying the features and benefits of each product within the suite and developing the strategy of how best to position these products in the market. The time I had spent in discussions with ports and pilots, as well as on site, allowed me to give an insight as to the perceived features and benefits from an operational perspective. I received an email from a major shipper explaining a situation they had experienced recently. This involved loading a vessel to a particular draft (determined by traditional methods) and then being unable to sail that vessel due to tide conditions deteriorating. Failing to sail a vessel means having to wait another 12 hours for the next high tide. This has serious financial implications for the ship charterer. They wanted to know how our system would handle this situation. By simulating the calculations, as if they were performed in real time using the actual data, I was able to provide them with a detailed explanation of how the application of our product would have avoided the situation they had encountered. The results highlighted the planning capabilities of the system and demonstrated significant improvements over their existing operations.	
I am part of the client support team. This involves being on call and responding to clients' questions and requests. The situations in which I've been involved range from IT related questions and networking issues, to operational queries and technical questions involving environmental conditions and vessel motions. One particular call I took led to a situation that had been developing for some time. An IT issue raised a concern that the client had had for a while, whereby he felt that he was not being fully informed of what was happening with the system around him. Through numerous correspondence back and forth, I was able to identify his primary concerns and offer a procedural solution to these to assist in moving forward. I met with the support manager and team to report of the client's concerns and how these had developed over time, highlighting actions on our part that had led to this situation and how it could best be managed in the future. The agreed upon procedures were communicated with the support team and have been implemented since. The working relationship with this client has improved as a result.	E8.4 Seeks client's feed back

Technical Sales 01/07/2007 - 09/07/2008	Competency Element Claimed
I was involved in the implementation of two new systems in the past few months. On both occasions, once the system was implemented, I maintained regular contact with the client to ensure they had a good understanding of the product and its implications on their operations, and that they were satisfied with it. This was a valuable exercise as in one instance it allowed me to identify early on misunderstandings some of the pilots had and clarify these before they became an issue. In the other instance, I was able to introduce minor changes that made the users' job simpler and significantly improved their experience with the product. Recently, I've had several meetings with clients to maintain relationships. Part of the reason for these meetings was to gauge satisfaction with the product. In one of the meetings, discussions led to a point where I was able to highlight a feature of which the client was previously unaware. This particular feature would enable the client to perform a planning task more efficiently. The other benefit that came out of the meetings was an understanding of the features not currently provided by the system that would be of value to the customer. I relayed this information back to the product development team. This information allows us to tailor future developments to our existing clients' requirements, but also provides market research as to what other prospective clients may value in new product offerings.	
I have been involved in a wide range of activities, to varying degrees, geared towards promoting our core products and consulting services to both existing and new clients. These activities have ranged from face to face meetings and presentations to higher level strategy development. In an effort to continually improve our products and services, and the way in which these are offered, I have also been active in seeking feedback from clients and supplying this information back to the support team and product development section.	Conclusion

State Engineer for Manufacturer to the Building and Construction Industry 01/07/2008 - 01/04/2009	Competency Element Claimed
As the state engineer a manufacturer and supplier of leading edge drilling, anchoring and fixing products to the building and construction industry, I have been responsible for providing technical assistance for products in our range throughout our state. During this time, I have worked in conjunction with the sales team to actively promote the use and to also seek specification of engineered products to clients via presentations, trade/industry shows and through direct consultation. For over fifty years my company has been an industry leader in the design, construction and testing of concrete anchorage and fixings systems. Products within my company's range that directly require my engineering input are primarily mechanical and chemical anchors.	Introduction
During my time with my company, I have implemented a system whereby I track the progress of large projects in the state in order to identify potential clients. This involves me conducting a search using a website featuring an online database of future, current and past construction projects in Australia, including details of companies and contacts involved which keeps up-to-date information on the progress of most projects in my state. With the intention of achieving maximum product coverage throughout the state, I tailor these searches to encompass each of my company's designated sales areas. By using this method, I am able to obtain the contact details of key individuals who would be interested in products within my company's range. I also pass the relevant details onto members of my company's sales team so that they can provide feedback on the status of each project. I also source potential projects and customers from relevant technical publications. I also visit engineering consultancies with the view to keeping engineers informed of my company's latest product developments and to address any potential design issues that are outstanding. Lastly, I undertake several site visits to speak directly to the engineers and procurement officers, with the intention to ensure that my company's products are being used correctly. In my state, my company defines a key major project as any project with a dollar value exceeding $20 million. Using the methods stated above, once a project has been identified, I schedule an appointment with either the project manager or site engineer to provide my company's Specifiers Resource Book (SRB). The SRB contains technical information for products within my company's range as well as providing other useful information relating to concrete anchorage. On several projects I have had to provide training that complements the SRB so the client can benefit from the information it contains. One notable example of a design requiring further technical information, not contained within our SRB, was on the largest bridge and road project in my state's history. Upon speaking to the lead engineer responsible for the design of the parapets, I was informed that due to post-tensioning cables present, shallow embedment depths could be expected for the installation of M20 chemical anchors. After I undertook further investigation into the application, I learnt that in order to ensure that every hole contained chemical adhesive, glass capsules were the preferred	E8.1 Identifies sales opportunities

State Engineer for Manufacturer to the Building and Construction Industry 01/07/2008 - 01/04/2009	Competency Element Claimed
system. As tensile strength is directly proportional to embedment depth, it was my responsibility to provide the project with the loads that could be expected under a number of different embedment depths and installation configurations. In terms of concrete anchoring, two potential design considerations are edge-distance and anchor-spacing. The former relates to the distance between the nearest edge and the anchor, while the latter is the distance that two anchors can be placed apart. On domestic construction sites where bracing is required, the process for construction is sometimes varied. Traditional methods use cast-in bolts to secure bracing, however precision is a major issue because the bolts cannot be moved once placed. A new way of undertaking such a task involves the use of chemical anchors which can be post-installed. While this system overcomes the potential shortcoming of precision it does pose the problem of edge-distance. In order to overcome this issue, I arranged a meeting with the designer of a popular bracing system to be used on another project. After speaking to him, I was able ascertain the desired loads and I proposed a design solution that uses a concrete anchoring product developed by my company to overcome this issue. Since I have undertaken this design, I have had a number of inquiries relating to the correct installation of concrete anchoring product for this application. In much the same fashion, I have approached a major shed builder to discuss several appropriate arrangements of my company's chemical injection products, which can be used throughout Australia to achieve desirable capacities. The major issue for this client was that there was a diverse range of end-users, and therefore, they were after a generic design. I was able to supply two designs which I classified into light and heavy duty, depending on the shed size. While working at my company, I had the opportunity to attend The Major Projects Conference 2008. This conference focused on presenting projects valued at more than $30 million that are either: currently under study, in construction, or recently completed. By attending this conference, I have been able to identify future technical and market trends. In relation to my company, I have been able to use the information that I gathered to focus heavily on railway, dam and tunnel projects throughout the state. In particular, I made contact with the administration for an upcoming railway project and provided technical information to this project about a concrete anchoring chemical injection product of ours, which fully cures in three hours at 20 degrees. It takes approximately 11 hours for other epoxy injection system of comparable strength to cure.	
Resulting from the geographical area that I am responsible for, there are a variety of design situations which required my technical input. As such, I was therefore responsible for ensuring that the client's needs were both identified and analysed. On one particular occasion I had to recommend an epoxy based injection system	E8.2 Applies product knowledge to client requirements

State Engineer for Manufacturer to the Building and Construction Industry 01/07/2008 - 01/04/2009	Competency Element Claimed

for chemical anchoring in a domestic application in the northern region of the state where there is a threat of potential cyclones. The current system that council had pre-approved involved using a peroxide initiated system for their chemical anchoring. After informing the client of the possibility of failure mode due to slippage in conjunction with the cyclone prone area, I was able to recommend a more suitable epoxy based injection anchor. Another advantage of this product is that the epoxy based injection system provided a better cyclic loading and overall better strength.

Due to the nature of my role, I am often asked to assist clients in specifying products that meet the intended requirements of their project. Recently, this has meant that I've had discussions with both the onsite project manager and the design engineer who produced the design for a catholic girls school. The drawings, which were given to the project manager by the design engineer, contained insufficient information to fix the studs into the concrete. The drawings did however state that my company's concrete anchorage and fixings systems should be used. I took it upon myself to design the appropriate system and send a copy to both the design engineer and the project manager, such that no time was lost on the project.

In addition to the above, I am also required to provide technical solutions to problems on projects that have a poorly defined scope. The most notable example of this involves recommending that my company's concrete anchorage and fixings systems could be used as a repair product to rectify a number of cracks on the headstock for a road bridge. I have also provided technical data for a situation where only 75mm embedment depth was available due to existing reinforcement. In this application, I presented the client with the option of using ferrules which solved his problem and gave him the required tensile loads.

Internally, I have been responsible for organising the testing of large diameter chemical anchor studs with relatively deep drilled holes. This testing was commenced after I received feedback from a large client.

There have been a number of projects within my state that have been designed to comply with Green Building Council Australia (GBCA) Green Star ratings. As such, I've contacted my company's industrial chemist to obtain information that relates to the Volatile Organic Content (VOC) of our construction chemicals, so that I can relay this information to anybody that requests it. I have also compiled all material safety data sheets (MSDS) onto a CD, which I have then distributed to a number of projects in an effort to promote the safe handling of our construction chemicals.

On two separate notable occasions, I've had to provide training to clients in the correct installation of my company's products. In the first instance, I've had to both demonstrate and explain the use of a fire-rated sealant marketed to electricians and plumbers. Also, I have had to provide a demonstration on a high strength, expansion anchor, comprising of a specially designed tapered bolt which was presented to scaffolders, as this mechanical anchor is marketed as the preferred system for tying scaffolding into the building.

State Engineer for Manufacturer to the Building and Construction Industry 01/07/2008 - 01/04/2009	Competency Element Claimed
I have been responsible for the training of internal staff and customers on my company's products, especially focusing on the technical attributes, features, advantages and benefits of these products. On one particular occasion, I conducted training of the internal staff on the process of how steel is graded. This involved me explaining yield strength and strain as well as the concept of ultimate strength. From this, I was able to show why grade 8.8 is superior to grade 5.6 and also highlight why stainless steel is different entirely. To promote my company's engineered products, I have developed marketing tools for engineers such as electronic newsletters, rulers, technical CD's and calculation tools. I have also developed a technical presentation, which I have delivered to a number of consultancies across the state. I have also modified this presentation to suit the intended audience, as was evident when I gave a technical presentation to the state government's workplace health and safety division on the desirable installation of my company's mechanical anchors. During my time at my company, I have had the opportunity to attend a number of industry conferences, many of which focus on the potential use of my company's products. The most relevant involved me attending a presentation for the Concrete Institute of Australia and highlighted three projects in south-east of the state. As my company's products were specified on all three projects, it gave me a chance to learn about the issues that lead to the choice of one product over another. I have since joined the Concrete Institute of Australia and regularly monitor upcoming projects through their bi-monthly publication.	E8.3 Promotes technical capability of the product / system
In order to establish that end users are satisfied with my services, I have made contact with several engineering consultancies, especially in the south-east of the state. One of the developments that my company has implemented involves the storing of client's details whenever they opt to download my company's design software. I have taken it upon myself to follow up each person who has downloaded this software and inquire as to which project they were intending to use it on. In regional areas of the state, once I have visited the area, I continue to make contact with the engineering office, either via phone or email to establish whether there are any outstanding design issues. While at my company I have had the opportunity to receive feedback from many clients in relation to how our technical information is presented. On one example, I was informed that the software does not match the SRB for some very specific applications. After taking this information onboard, I then investigated it and reported back to the client that the software was actually correct due to the complexity of the situation. I have also placed my company's logo on a database which I send to various engineering firms which relates to the expected tensile loads with increased embedment depths. As part of my role, I am responsible for gathering and relaying product development information to both product managers and engineers with my company. The nature of this information included whether additional testing is required for our	E8.4 Seeks client's feedback

State Engineer for Manufacturer to the Building and Construction Industry 01/07/2008 - 01/04/2009

Competency Element Claimed

product range and providing updates on which products are my company's biggest sellers. In a notable example, based on feedback that I had received, I made the recommendation that my company's range of heavy duty mechanical anchors should be fire rated. Also, following a number of inquiries regarding the use of my company's products when the substrate is timber, I made the recommendation that this situation should be tested.

In surveys that I have undertaken and relayed to the management, I have recommended that capacity information be produced for core-filled blockwork, as this is a popular fixing environment encountered in my state. The current system involves using a combination of design information for hollow blockwork and assuming that the anchor is embedded in the substrate as if the blockwork was not present.

I was also tasked with the investigation of suspect products and failures and reporting outcomes to the relevant parties, both my company and the client. This ensures that where appropriate, ongoing client support is provided. As I provide the bulk of engineering advice for my company in my state, I focus heavily on client support as this ensures that our products continue to be specified in the future. I have often received compliments from both small and large consultancies thanking me for my continual, timely support in matters relating to concrete anchorage.

Collaborative Mine Planning Trial 04/09/2007 - 19/12/2008	Competency Element Claimed
In mid-2006 Mining Company A (MCA) began trialing their Remote Operations Centre (ROC), which primarily focused on pit and plant control of several mine sites in a localised area. As part of their vision for remote operation, MCA launched a group of projects that were aimed at developing technology and redesigning process work flows that would allow a number of services and roles to eventually be moved off site and back to the nearest capital city. One of the projects that I was involved with was the Collaborative Mine Planning Trial where I (as part of a consulting project team) was contracted by the MCA Technology Division, to provide professional engineering services. I was tasked with assisting the senior engineer to deliver two work packages. I was required to implement technology that would allow the mine planning department at each site to have access to their systems on site, and to develop a tool which they could use to collaborate and share information, in real-time, between sites.	Introduction
Operational teams on site have various interactions with each other as part of day-to-day encounters. These can be in the form of formal meetings (groups that meet at predetermined times during the week), informal meetings (walking up to someone's desk and having a discussion) or interactions out in the pit or over the two-way radios. Therefore physically separating these teams, relocating some roles to the capital city and leaving the remainder on site, would mean that a tool would have to be developed that would ensure that this communication could still take place. Another important factor that had to be considered was the simplicity of the system from the users' point of view. My first task was to develop some core functionality that the system would have. To get a better idea of what this would be, I met with one of the operational engineers from one of the sites. After some discussion, it was clear that the system would require - at the very least - a video conferencing system and an interface for sharing pit maps and spreadsheets, all in real-time. My next task was to engage with MCA's IT department, to get an idea of the networks' links between the mine sites and the capital city office to determine network constraints for the system. MCA had already upgraded their links to run the trials for the Remote Operations Centre projects. The IT department also informed me that MCA had a standard choice of vendor for video conferencing equipment which helped to narrow the possible solutions down to a Polycom system. After I had determined a maximum throughput allowance for the system, it was time to research available technologies that would fit requirements for sharing pit diagrams and spreadsheets. A number of touch-table style products were looked at including Microsoft's Surface, products from Touchtable Inc etc. At the time, the project team happened to be engaging with an audio visual company for some minor works at the ROC facility, so I decided it would be worth getting some information from them, on possible video conferencing solutions, as they were a supplier of Polycom equipment. It turned out that they were also suppliers of various 'collaboration' systems, so I scheduled a demonstration of	C2.2 Prepares concept proposal and seeks advice on latest technology

Collaborative Mine Planning Trial 04/09/2007 - 19/12/2008	Competency Element Claimed
some these systems, so that key members of the project team could have input and assist in making a decision. A number of systems were demonstrated, including 'active pens' with ultrasonic sensors, capacitive touchscreens and so on. Finally the decision was made to proceed with a high-definition LCD screen that would lay horizontally with an infra-red matrix touch overlay placed over it. The audio video consultant also provided me with information in regard to lighting and noise isolation requirements requiring consideration. This led to the concept of an enclosed room or a 'collaboration room' as it came to be known. The final concept proposal that I put forward described a room, consisting of a touch-table, a high-definition projector (viewable by a larger audience than just those gathered around the table), concealed speakers and microphones. All this connected to a Polycom video conferencing system providing the functionality for users to video conference, share documents and diagrams in real-time, connect laptops on the fly, with the additional ability to view CCTV footage from cameras located on site - all within the network throughput allocated by the IT department. The system would be centrally controlled through a simple easy-to-use touch screen interface, similar to those commonly used in meeting rooms and boardrooms fitted with advanced video conferencing systems.	
Throughout the design process I produced and maintained all the design documentation relating to my work packages, including functional specifications, scopes of work for contractors and testing plans. The functional specifications were produced in line with my organisation's documentation requirements as part of their quality assurance procedures. This included the use of standard document templates, submitting/requesting documents through document control and the use of revision control to update design documents as necessary. Further to these design documents, I developed user manuals and support manuals for the systems implemented which detailed all the information required by the client to operate and support the technology. This documentation included clear, concise instructions on how the system should be operated, including illustrations, diagrams and high-resolution photographs, as required. At the end of the project, I created a Manufacturer's Data Record (MDR) folder structure with a web-based front end. I then populated it with all the design documents, drawings, manuals, photographs and other important information. This was then handed over to the operations team to be used for support, maintenance and possible replication of the system across other sites.	C2.5 Prepares and maintains documentation during the design process
As part of the engineering process, I was responsible for the testing phases of my assigned work packages. This included the scheduling of factory acceptance testing (FAT) and site integration testing (SIT). In order to formally complete the testing I developed test plans that ensured that the functional requirements of the system had been met using the functional specifications and the requirement specifications as the basis for the test plan.	C2.6 Validates design

Collaborative Mine Planning Trial 04/09/2007 - 19/12/2008	Competency Element Claimed
Before the systems were shipped to site, they had to undergo factory acceptance testing, at each of the vendors' premises. The FAT was aimed at testing the functionality of discrete components and sub-systems, because both of my assigned work packages relied heavily on the client's corporate IT infrastructure. This testing was undertaken by myself and another senior member of the project team, in accordance to the test plan I had developed. After the completion of the implementation stage and associated works, the system had to undergo site integration testing. This was undertaken by myself with a client representative present, again using the test plan that I had developed. During this stage the client suggested some minor modifications to the system hardware and control software. After these changes were made, the system underwent another SIT with an updated version of the test plan.	
At the end of the project, two collaboration rooms were built, one in the capital city and one at a predetermined test site near the mine sites. Once the project team had completed all their assigned work packages, the Collaborative Mine Planning concept was successfully trialed over a three-month period in which minor technology issues were identified and resolved. However, a number of human resource issues were highlighted during the trial, and full scale implementation across all sites had to be put on hold until these were resolved.	Conclusion

Incident Investigation 01/04/2007 - 30/06/2007	Competency Element Claimed
During my time with an engineering consultancy, our organisation was engaged by a state government department to carry out an investigation of a fatal industrial incident involving a drill rig pneumatic system. The drill rig relied on compressed air to transport the sampled ore from the bottom of the drill hole to the surface. The incident involved a sudden release of compressed air on the surface, leading to a section of rubber hose striking a member of the drilling team. The project stakeholders included the statutory authority responsible for mining safety, the drill rig manufacturer, my employer and the company whose lease the incident occurred on. As project engineer, my responsibility was to manage the investigation and provide a report on my findings.	Introduction
As my exposure to compressed air systems and incident investigations was limited, I set about identifying useful sources of information. I identified our client, the state government department, as a useful source for the format of an incident investigation. They were able to provide me with a standard template that they used for their own internal investigations. For the technical side of the project, I approached a senior mechanical engineer in my organisation with extensive design and operational experience in the area. I arranged a meeting in which this engineer gave me a brief overview of compressed air systems during which I asked several questions I had generated. I received further assistance by questioning this engineer several more times during the course of the project and borrowing several books on the subject recommended by this engineer. In the words of the state government department contact, our original scope was to 'determine why the incident took place'. I believed this scope in its current form was much too general to work with so I worked on better defining the scope. After some consideration, I proposed that my brief be broken down into three main questions: • Assuming all components were in good condition, was the system capable of operating at it's nameplate capacity safely? • Was the equipment in good condition when the incident took place? and • If not, was the poor condition of the equipment due to inferior manufacturing and construction or due to inadequate inspection and maintenance?	E4B.1 Responds to / Identifies problems
I discussed the revised brief with my state government department contact and the drill rig manufacturer, who agreed that it was an improvement on the original and that the brief would be considered complete if the three questions were answered and sufficiently supported by facts. Once the scope was agreed upon and I had undergone a brief review of compressed air systems, I commenced with planning the investigation by creating a list of all tasks that needed to be completed to ultimately answer the three questions in the work brief. The tasks fell into four main categories, those being the completion of the engineering calculations, review of inspection and maintenance history, provision of drawings and a physical inspection of the drill rig itself. Given the standing of my employer, a multi faceted consulting company, I determined that an inspector from my employer's asset management division would be the ideal person to examine the drill rig in question and provide an expert opinion on the condition of	E4B.2 Plans the investigation

Incident Investigation 01/04/2007 - 30/06/2007	Competency Element Claimed
the components. Similarly, I determined that a draftsman would be required for the provision of drawings, including a Process and Instrumentation Diagram (P+ID), Process Flow Diagram (PFD) and general arrangement. I would assume responsibility for the engineering calculations and inspection and maintenance history review. Using the list of tasks to be completed, I then discussed with the relevant department managers in my organisation what they expected the working hours for each task were likely to be and confirmed that their personnel would be available to complete the work in the required timeframe. I then prepared a cost estimate based on the number of working hours required for each task. During the course of the investigation, I maintained contact with both the drill rig manufacturer and the state government department. The manufacturer was keen to be updated on my progress as the drill rig in question was sitting idle in their yard pending the final report and subsequent actions required or penalties imposed.	
As the investigation moved into the execution phase, I organised for the draftsman to commence the drawing tasks and for the inspector to inspect and provide a report on the condition of all system components. As I commenced my engineering calculations, I reconsidered the scope I was working to, which was namely the answering of the three questions previously listed. It was on further reflection that I realised the first question was better phrased as two questions. Firstly, was the circuit adequately designed to prevent more output (in terms of flow and pressure) being produced than the nameplate capacity?; and secondly, were all components of the system capable of performing their duty when the system was operated at nameplate capacity? For the first issue, I used the P+ID and PFD to examine all the possible operating situations (for example, with a given valve open / closed or a given compressor operating) to check whether there was any possibility of the system producing more air flow or pressure than the nameplate capacity. Finding no faults with the overall system design, my attention turned to the capacity of the system components to handle the applied forces. From my background research, I had determined that the main forces were due to a change in direction of the air flow in the circuit. I used the compressor pressure and flow output and the worst case change of direction possible (in this case, a right angle bend) to compile a free body diagram to determine the forces present. It was at this stage that I checked my results using Helix Flow, a computer software package owned by my employer. The computer results were within 10% of the forces I had calculated, increasing my confidence in the validity of the results. Once I had determined the forces, I organised for a detailed drawing of the failed section to be created, allowing the individual components (including rubber hose, flanges, bolts, retaining chains, etc) to be better identified. I then collected details of all the components, including the material of construction and rated capacity.	E4B.3 Carries out the investigation

Incident Investigation 01/04/2007 - 30/06/2007	Competency Element Claimed
It was then a matter of checking that each individual component was capable of handling the maximum forces present. My colleague from the asset management division used the details I had collected on all the components to assess their present condition. My colleague stated that all components were in good condition, but there were some discrepancies between the drawing and what was installed.	
Before I finalised the report, I discussed my preliminary findings with the state government department, the drill rig manufacturer and several of my colleagues to allow review and provide feedback on my conclusions, which are summarised below. An error during construction had led to 6mm bolts (instead of 8mm) being used in 10mm bolt holes. As a result, there was insufficient contact area between the flange and the bolt heads and the bolts were pulled through the flange. While a major factor, this was not the sole cause of the incident as there should have been two restraining chains in place as a back-up system to prevent the flange separating. However, only one of these chains was installed at the time of the incident and was inadequate to restrain the forces present. In addition, correctly completed pre-start and other inspections should have picked up the incorrectly sized bolts and the absence of a second restraining chain. My colleagues and the state government department both agreed with the findings while the drill rig manufacturer was unhappy that the majority of blame was apportioned to them, though was unable to provide alternative conclusions based on the data. Shortly after submission of my report, I contacted the state government department to ensure that they were happy that my scope of work was complete. They were satisfied with the structure and content of the report and that all deliverables had been met.	E4B.4 Draws conclusions and makes recommendations
I enjoyed the challenges posed during this project, from the identification of the issues and planning phase through to ultimately drawing my conclusions based on the data. The tragic circumstances which instigated the investigation also gave me a much greater appreciation of the importance of upholding high professional engineering standards throughout my career.	Conclusion

Train Positioner Drive Module Fatigue Analysis and Arm Force Measurements 13/09/2006 - 01/11/2006	Competency Element Claimed
The in-loading facility at a mining company site uses a rail mounted positioner to index rail ore cars into the car dumper rotary cells. The train positioner was upgraded in 2001 and is currently driven by 12 VVVF drive modules, in a 6 pair arrangement.	Introduction
With growing global demand for iron ore leading up to 2007, payload in the ore cars and length of the train rakes had increased significantly over the years. Inspections during routine maintenance revealed structural cracks in the positioner drive module bases and the drive module hold-down bolts were reported to suffer failure frequently. As a result, the electric drive modules were unable to achieve the expected service life, on average requiring replacement at less than 2 year intervals. The mining company engaged our firm to undertake an analysis and investigate ways to improve the reliability of the positioner by extending the service life of the drive modules. In response to the client's request, a project team was assembled, led by our test and analysis group. Due to the size of the investigation, most tasks were divided between two mechanical engineers. I was allocated the responsibility of carrying out the site test work to collect data and assist with the development of a finite element analysis (FEA) model to analyse the data. I identified the scope with the project manager and gathered relevant background information to prepare for the site visit.	E4B.1 Responds to / Identifies problems
A kick-off meeting attended by the project manager and site representative was organised to develop a plan of attack, identify main tasks and key dates for the test work. It was agreed that the scope of work for the project should include measuring positioner arm force and travel speed, assessing the loads acting on the drive module hold-down bolts and undertaking fatigue analysis of the drive module. After finalising the project scope and the date of the site visit, I started to prioritise the preparation work. My first task was to gather relevant drawings and get familiar with the positioner design and operation. I then discussed with the project manager (an experienced, senior test and analysis engineer) to determine possible test locations to install the instrumentations. I was responsible for preparation of test equipment including strain gauges, an encoder, a laptop computer, data logger and cabling etc. To measure the travel speed of the positioner, I designed a mounting bracket to install the encoders to the positioner wheel. Using as built drawings and some site measurements, I developed a drawing of an aluminium bracket which was sent to the workshop for fabrication. To measure the load on the hold down bolt during operation, I procured 5 specially fabricated hold down bolts having 3mm holes drilled in the centres. A small strain gauge, specially ordered from Japan, was then bonded to the inner surface of the bore in our lab facility. Detailed planning for the site work was paramount as instrumentation could only be installed during a 4 hour window and there would be limited access to the	E4B.2 Plans the investigation

Train Positioner Drive Module Fatigue Analysis and Arm Force Measurements 13/09/2006 - 01/11/2006	Competency Element Claimed
equipment during operation. Any delays to the train schedule by this test work would not be acceptable. To avoid potential problems, I liaised with rail operational personnel and the scheduler to discuss my plan and the logistics required for the test. I prepared and submitted a shutdown schedule for the test work which included all necessary tasks. Contingency plans were also put in place, in the event that our test equipment malfunctioned during logging. Health and safety issues were another major concern for our site test work. After a brief assessment, I identified several risks for working on operating equipment. The issues were discussed with the project manager and we developed a safe work procedure to mitigate the risks. A risk register and a Job Safety and Environmental Analysis (JSEA) were prepared prior to travelling to site. Both documents were submitted to client representative for review and approval. Following the clients' requirements, a 'take-5' was completed each day on site prior to commencing work.	
The first phase of the investigation involved site test work for data collection. Prior to the scheduled shutdown, I was accompanied by the maintenance superintendent to inspect the car positioner and discussed my work procedure during the shutdown. In the maintenance workshop, I examined one of the damaged hold down bolts and found 'beach' marks and yield damage on the fractured surface, which are the tell tale signs of fatigue damage. Some of the instrumentation and cabling was pre-installed onto the machine and was individually tested to ensure all equipment was functioning properly. Some cables were found to be damaged and I carried out minor repairs. During the scheduled 12 hour shutdown I: installed an encoder onto the front wheel of the positioner to record travel speed; mounted accelerometers onto the drive gearboxes to record module vibration; and four strain gauges (wired into a Wheatstone bridge circuit) were attached onto the positioner arm to record push forces. The gauges were located on opposite sides of the arm to measure bending strains and calibrated to generate a kN force output by comparing the arm strain signal to the previously calibrated drawbar on the rail car. All existing drive hold down bolts on one module were replaced with strain gauged bolts to record forces in the bolts. At completion of the shutdown, I commenced data logging by using a data logger and laptop computer on board the positioner. Several train rakes were monitored during the unloading operation. The signals from all the instrumentation were recorded at a rate of 500Hz using a SOMAT eDAQ field computer system. All equipment was removed from site after 48hrs of data logging. The second phase of the investigation involved post processing and assessment of the collected data. This involved developing a FEA model of a drive module, carrying out a bolt joint analysis and estimating the fatigue life of each drive module. Whilst I was not responsible for the development of the FEA model, I worked closely with a fellow mechanical engineer in charge of the FEA to interpret the results.	E4B.3 Carries out the investigation

Train Positioner Drive Module Fatigue Analysis and Arm Force Measurements 13/09/2006 - 01/11/2006	Competency Element Claimed
The assessment of the bolt fatigue life was carried out in accordance with methodology set out in BS7608. The data acquired from the hold down bolt strain gauges was processed to convert strains to stress. I then used the data to calculate cumulative damage and life estimate for each bolt using a MATLAB program developed by the project manager. The results were then compared with the NDT records of replacement intervals. The results confirmed that the bolts failed prematurely, however some bolts were in service well beyond their calculated service life. Based on these findings, I was able to eliminate the possibility of inadequate bolt strength as a potential design flaw. To isolate the root cause of the premature failure, it was decided that a bolt joint analysis should be carried out using the maximum calculated load. We analysed the load sharing between bolt and joint members by determining the ratio of bolt-joint stiffness.	
Following the analysis, I prepared a summary report to detail the methodology and findings of this investigation and proposed a number of recommendations to rectify the problem. Based on the results, I concluded that the hold down bolts appeared to have adequate design yield strength and fatigue strength. It appeared that inadequate preloading was most likely to be the primary root cause of the premature failures of the drive module bolts. My calculation estimated that if adequate pre-load was applied, the fatigue life of the bolt is approximately 1.2m cycles or 7 years. However in the absence of sufficient preload, the bolts were susceptible to fatigue failure and the estimated bolt life was reduced to an average of less than 4 years. The observed bolt life was in the range of 3 months to 2 years at the time of conducting this study. It was also noted that some bolts had never failed, suggesting adequate preload may have been achieved on at least some of the bolts. Visual inspection of the mounting plate indicated that the threads in the positioner frame were damaged. I concluded that this was likely to be a contributing cause which prevented the correct joint preload from being attained. Cracking of welds in the platework containing the threaded holes was also observed. The steelwork should have been refurbished to provide a sound threaded hole for the bolts. All observations were photographed and documented in a brief site visit report for client review. With these findings, our team put forward a number of recommendations to improve the service life of the drive module assemblies. We envisaged that the fatigue performance of the hold down bolts could be improved by design modifications such as lengthening the bolts and introducing a cylindrical spacer. These measures were intended to reduce the stress range in the bolts and reduce the susceptibility of losing preload as the modules bed-in during operation. Other	E4B.4 Draws conclusions and makes recommendations

Train Positioner Drive Module Fatigue Analysis and Arm Force Measurements 13/09/2006 - 01/11/2006	Competency Element Claimed
measures involved reviewing current maintenance practices to include regular inspection for cracks on mounting plates, application of full penetration welds for repair, and the recommendation to use proper tools and techniques to ensure that a correct amount of torque was applied to the bolt joints. During the investigation, I regularly briefed the project manager on the progress of the project. Towards the end of the investigation, I issued a draft report to the client and stakeholders for review. Upon receiving their feedback, I incorporated their comments in the final report. On completion, I presented the findings and recommendations in a summary report to the project manager, client representatives and other stakeholders. The client subsequently accepted the findings and implemented the majority of recommendations.	

Peninsula Rail Audit 28/05/2007 - 31/10/2007	Competency Element Claimed
An interstate rail operator engaged my company, a consulting engineering organisation, to undertake a site audit of a rail track on a regional peninsula and a desktop study of two bridges in the network. The two bridges were approximately 80 years old and it was assumed that they had reached the end of their design life. After the proposal was accepted by the client, I was given the responsibility of being project manager and client liaison. My company entered the project in an alliance with another consulting firm. This meant that there was a requirement for special consideration during all client interactions, including invoicing and prospects for future work. The client was new to the structural section of my company, and the proposal was written with a low margin and tight budget to increase the probability of winning the proposal. This project was the first I had managed, and I had to address the associated challenges. This included becoming familiar with the standard company forms and procedures while delivering the project on time, within budget and to a high quality.	Introduction
Before the project began I researched background information and found an article on the rail infrastructure on the regional peninsula. The article outlined the dependency on the rail network to transport grain to the port, and how the transportation authorities had undervalued the required investment into the network to keep it serviceable. From this I knew that the local community would be supportive of any remediation work to the rail network. From reading my company's national and regional action plan, I knew that bridge design was one area my employer would like to focus on and that this project was a step towards increasing the rail capability within my company's structural section. Using my company's procedures I purchased a book about railway audit and assessment. This helped the design engineer to write the report because the book provided templates and key areas for auditing. The book will also be a good reference for future rail audits. Before engineering time was carried out on the project I completed a plan for the project. This plan detailed the breakdown of the project including deliverables, risks, communication and quality review. I reviewed the plan after the kick-off meeting and added more detail, such as giving a broad outline of the sections that the report needed to contain. I broke down the project into distinct tasks and allocated 'milestones' (delivery dates) to each, so that the next task could then be started on time. These milestones required a meeting or phone call with the client to indicate progress. I documented that we intended to issue deliverables in the form of informal email attachments in the client service brief, as discussed below. The design engineer who had written the report, Engineer A, needed regular communication with the alliance partner and the client for feedback. Before the engineer started the report I asked the engineer to communicate solely through myself and the alliance partner. This ensured that the alliance partner always felt like he had contributed equally to the project. The engineer nominated to audit the railway could not write the report as well, so I organised and chaired a meeting with the engineers A and B to communicate the required input and output from each	E1B.1 Develops project integration

Peninsula Rail Audit 28/05/2007 - 31/10/2007	Competency Element Claimed
stage. This ensured information was not lost between the two tasks and the two engineers. Fortunately the engineer who wrote the report was also available to carry out the site audit.	
After I read through the proposal and talked to the engineer who wrote the report I developed a client brief, which outlined the key delivery dates, standards and analysis methods we intended to use. I also reviewed the minutes from the kick-off meeting that I had organised to find the expected outcomes of the project, which included site assessment and a final report. I told the afore mentioned engineer that I intended to only deliver a draft report, then possibly another draft at the client's discretion and then finally the completed report. This eliminated the possible iterative issues, but ensured that the report was of satisfactory quality. I then forwarded the brief to the client and alliance partner for their review. The client called and told me that he expected us to deliver detailed sketches. I told him that we did not intend to do this and that I would get back to him. I then re-read the proposal and found that detailed sketches were explicitly stated as an exclusion. I called the client and we came to a mutual agreement that my company would deliver a layout sketch for each bridge and details would be done at an additional fee. I knew that this would increase the cost to us, but for this project, client satisfaction was more important than profit. I then altered the client brief and re-sent it. The client was satisfied with the outcome and I gained verbal approval, which I documented via a telephone conversation record. I fragmented the project into key tasks which included a site visit, a desktop study and a final report. For each task I allocated a colleague in the software package RAMPP, which set aside a number of hours during their week for my project. This ensured that staff were available when they were required for the project. During the kick-off meeting the constraints of the project were stated, and I documented these in the minutes. One such constraint was the recommendation by the alliance partner not to reduce the clear area beneath the bridges as the rain probability of the region was unknown and a large rainfall could cause an unprecedented flood. I documented this in the minutes for future work if my employer was later engaged to design a replacement culvert. I also documented environmental considerations during the site audit in the HESP (Health, Environment and Safety Plan) as mentioned below. One such consideration was to minimise the damage to native flora by always driving on the tracks instead of making new ones.	E1B.2 Scopes the project
Initially I felt there might be some risks associated with the project so I completed a risk assessment when I set up the project. The main risk I identified was that the structural group was undertaking a new kind of work. I decided that this was an acceptable risk as we had interstate experience in the field that we could call upon for advice, if the need arose. I spoke with the principal engineer (the author of the proposal) about intended quality control. The engineer intended to review the final report himself. I discussed this with Engineer B, who was doing the design, and we came to the agreement	E1B.5 Manages quality, safety, environment and risk

Peninsula Rail Audit 28/05/2007 - 31/10/2007	Competency Element Claimed
that another design engineer would be needed to review the desktop study. He suggested someone from an interstate office and we agreed an estimated amount of hours for the review. I then requested that he make contact with the reviewing engineer to confirm their availability. After the review had taken place I discussed with Engineer B the outcomes and how these were to be incorporated into the project. One such outcome was a more accurate model of the connection between the rail and the support beam. After the draft report had been written I organised the principal engineer to review it before sending it on to the client. Due to the hazards in site work, I identified that the project would require a HESP. To do this, I compiled HESPs from similar projects to identify likely hazards. Through discussions with the client I gained an understanding of the site conditions and was able to then think of hazards associated with the work, such as working within the rail corridor and sun exposure. I listed the potential hazards, then used our company's standard risk classification system to associate a level of risk to each hazard and the corresponding worst consequence. I then used the hierarchical risk mitigation list, learnt during my 'Green Card' training, to think of ways to eliminate or reduce them. This could be as simple as making the site personnel aware of the risk, such as driving while weary. I also included a map to the nearest hospital and contact numbers for emergency response, my company's safety officer and myself in case an accident should occur. After the site visit I asked the engineer to comment on the HESP and include any new risks that he could identify. He told me about the hazards of working with the DCP (Dynamic Cone Penetrometer). I amended the HESP for future reference.	
As part of the project plan, I broke the project down into smaller tasks using a Work Breakdown Structure (WBS). I then scheduled the project staff and number of hours allocated for a particular task. I allocated a profit margin, contingency and any other costs, and 'worked down' to the hours available for each task. I then discussed each task with Engineer B and 'worked up' the number of hours required. Where the hours required did not match the hours in the budget, I cut down hours from non-critical tasks and reconfirmed them with the Engineer B. The budgeted hours were close to the predicted because the project had already been scoped in the proposal. I then used these hours to write activity descriptions for each project staff, which detailed their allocated hours, delivery date and level of verification. I reviewed this budget weekly to see how the project was tracking and update the client weekly on our progress. The majority of time on the project was to be spent by Engineer B writing the report. I met with him weekly to discuss the remaining scope of the report, the time he thought he would take to complete it and the remaining budget. I recorded the hours and percentages on the weekly project financial reports and filed them. I also filed the printout of hours put to the project, which I had requested from the project administrator every couple of weeks. It appeared that Engineer B was going into too much detail with the report, so I discussed with him the urgency of finishing it. I also discussed the level of detail the client was expecting in accordance with the contract. We agreed to leave out some less important detail in the report, which could then be presented in the client meeting.	E1B.7 Manages time and progress

Peninsula Rail Audit 28/05/2007 - 31/10/2007	Competency Element Claimed
Towards the end of the project it became apparent that the remaining budget was tight, so I investigated ways to cut project costs. As I had little technical input into the report, I discussed the possibility of not attending the final meeting with the client, alliance partner and Engineer B. This was agreed to. I then converted my budgeted hours into hours for Engineer B to finish the report, which he managed to do within the modified budget. I then spoke with all parties after the meeting to make sure there were no issues with the report, or that I did not miss anything relating to the overall project.	
The project was finalised by the senior engineer incorporating the comments from the final meeting into the report and issuing it to the client. As I did not attend the final meeting, I discussed the outcomes with Engineer B. Due to the continual feedback we received from the client and alliance partner throughout the project, the client requested very few changes be made. I verified this when I called him regarding the invoicing of the project just before completion, and documented it in a telephone conversation record. To finalise the commercials of the project I completed a project close-out form. This involved documenting the budgeted and the actual profit margins, which for this project were reasonably close. I also requested an independent client survey, so we could record our performance and learn from any problems that had not been brought to my attention (if any). The form also included checks that all deliverables had been issued and all documentation had been filed, which I confirmed that they had. Due to an administration error the first invoice was mistakenly sent directly to the client, instead of the alliance partner, as he had requested previously. It was imperative that the final invoice was not sent to the client, and to sustain the relationship with the alliance partner I decided to personally deliver it. I called him and arranged a time, then walked over to his office. I discussed with him the outcomes of the audit and the possibility of future work, and asked for his opinion on how we should proceed in obtaining future work from the mutual client. He was quite open about our company pursuing ongoing work with the client, and only requested that we inform him when submitting a proposal to the client, so that he could see if there was any scope for his firm to add value to the project in an alliance. I kept in contact with the client via phone calls asking about the progress he was making with the recommendations we had made, and a few months later we were asked to tender for further work on the rail network. Before submitting the fee letter I called the alliance partner and discussed the tender with him. For this project there was little scope for the other consultancy, and therefore we solely tendered for it.	E1B.8 Finalises the project
This project was the first project I managed and it had a tight budget. I found that by keeping everyone in the project up to date and by dealing with issues as they arose, the project ran within the budget and timeframe. The client was pleased with the end deliverables, and is now working closely with my company to progress further remediation work to the state's rail networks.	Conclusion