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WIL Report 1

# Executive summary

This report provides a brief overview of my experiences with industry based work for my first thirty days of placement. During my first thirty days of industry based work experience I had the opportunity to work at Telstra, Australia’s leading telecommunications company, and Leggett’s Electrical, as a trade’s assistant for an electrician. I participated in a wide range of duties, which included working in the field and in the office. The many different tasks I did included working on a construction site wiring up a new factory that was being built, working on Telstra’s telecommunications network on a wide range of tasks, networking with a wide range of professionals and experiencing the industry. I also gained experience in holding a full time job and the many other things that go with it including workers compensation, professional property and professional standards that have to be abided by in the workplace.

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# 1.0 Workplace

## 1.1 Introduction

Prior to my industry based work experience at Leggett’s Electrical I had completed two and a half years of my degree in electrical engineering and worked various part time jobs. I had worked for Leggett’s Electrical various times before my work experience, as a trades assistant participating in electrical work in both domestic and industrial locations. This work mainly involved wiring and helping with installations of various electrical equipment. As mentioned above I had also held a few other part time jobs, which were all hospitality based. Although these do not directly have anything to do with engineering work, they help build general skills necessary for working in any field. These skills involve interacting with customers and colleagues, time management skills and working under pressure. By the time I got my work experience at Telstra I had finished my third year of university with a GPA of 5.5 and started my second major in telecommunications. I had also finished my work experience at Leggett’s Electrical, which gave me valuable field experience.

## 1.2 Employer Organisation

My first placement was at Leggett’s Electrical, an electrical contractor company. Leggett’s Electrical first started practicing in 2000 and is just a company with a workforce comprised of a single electrician. Leggett’s Electrical mainly does industrial and domestic work for a wide range of electrical work. During my time at Leggett’s Electrical I worked as a trade assistant, which meant that I helped with whatever duties the electrician I was working with was doing. I also did some individual work such as running cables in the office.

My Second placement was at Telstra, the leading telecommunications company in Australia. Telstra was founded in 1975 as Telecom Australia, where it later changed its name to Telstra in 1995 [1]. The Telstra network covers 2.3 million square kilometres of Australia and offers the fastest and most reliable mobile network in Australia [2]. Telstra offers many telecommunications services which include, mobile and fixed line services for personal and business use. I worked at Telstra as a network engineer, where I did various engineering related jobs that included planning and design work for the new LTE700 network, some clean up jobs such as data alignment checks, and some optimisation and testing work.

## 1.3 Work Environment Conditions

Workers Compensation is a form of insurance that employers have to provide for their workers to cover for injuries that have occurred due to a workplace related incident. These injuries could be physical, mental, a disease, aggravation of a pre-existing condition or even death [3]. Employers have a duty to their employees under Australian law to provide workers compensation to all workers working under them under a contract [4]. This workers compensation can be used to claim payment for lost wages, medical expenses, rehabilitation, and death benefits, such as funeral expenses [5]. For my work experience at Leggett’s Electrical having workers compensation was a prerequisite for working on the site and I would not have been granted access to it otherwise.

I was required to get a white card for my work placement with Leggett’s Electrical, as the work was on a construction site. This was again provided by the company and was done through blue dog training with their online course. For my work at Telstra a white card was not needed but since I had already acquired one from my previous work placement I had it if it became necessary. I also had to go through a site induction for my first work placement which involved identifying dangers and other important places on site. At Telstra there were weekly meetings in which we could discuss health and safety issues affecting us and there was a presentation each week on different health and safety issues that we may experience. There was also a mandatory health and safety quiz that had to be undertaken which involved evacuation procedures, identifying wardens and other safety procedures.

Intellectual property refers to a creation of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce [3]. There wasn’t any intellectual property that was created in my first work placement, as my work there was mainly physical labour that gave me on site experience of implementation rather than any planning, design or optimisation work. During my second work placement there was a lot of work I did that was left with Telstra, as their intellectual property. This work was done using their software and equipment under guidance from other Telstra employees. I transferred over all work that was needed by anyone onto a network drive under the relevant site names. I also archived any changes I made to any of the databases that were implemented or in the process of being implemented.

To ensure the quality of my work during my placements I was working under supervision. While working on my first placement at Leggett’s Electrical I was working closely with the Electrician, so almost everything I did was checked. I also wasn’t allowed to be the one who directly connected up the wires, as I am not a licenced electrician, although I closely observed the process and would have had the skill and knowledge to able to do, so by the end of my work experience had I been allowed to. My work at Telstra was also checked by others in the work place and I had another colleague mentoring me to ensure the work I was doing was to the standards that Telstra expected. There were many standards that I had to apply to the work I was doing such, as the ARPANSA standards for electromagnetic radiation that was being produced by the many Telstra antennas.

Telstra has a lot of company policies that range from information security to recycling to harassment. When you first start working at Telstra there are 10 or so quizzes that have to be taken along with the corresponding slide pack to give you all the information you need. You then have to score 80-90% on each of these quizzes to pass to show that you have read and understood all of the information. There are also yearly quizzes that all employees have to do at the start of every year, as a reminder of this information, which meant that I did it twice during my time there, as I did it in December when I first started working too.

# 2.0 Work Activities

## 2.1 Major Activity Reflection 1

The major job I did while on my first placement at Leggett’s Electrical was doing the wiring for the various installations that were required for the factory and office that were being built. In the factory wires were mainly run along the various beams that were used to support the roof and then when it was run down the wall in pvc pipe or along a cable tray to prevent access to the wires. This was done on a scissor lift to give easy and safer access to the roof and to reduce the time taken to reposition and go up and down a ladder every couple of meters. Wiring inside the factory was mainly for lighting which was just run along a beam and then a loop was left every few meters for quick connect power points [1] to plug the high bay lighting into. Quick connect power points were used for ease of use and speed of installation. Instead of twisting up wires and screwing them into the power point plate instead the quick connect power point just has to be clamped down on the wire and it cuts through the insulation to connect to the wire. Other than that there was emergency lighting and exit lights that were installed and some three phase wire was used to power the roller doors. There was also a secondary switch board installed on the other side of the factory, as there was a large dividing wall that has been installed to fireproof the separate sides of the factory. The wires to take power to this secondary switch board were taken under the floor before any concreting was done. This meant that power was supplied to both sides of the factory without compromising the wall.

In the office there were a lot more installations that had to be done. There were multiple power points, lights, data points and other installations that had to be done for each room. Unlike the factory that had places to run the wire the office was using ceiling tiles which hadn’t been put up yet. To run the wires some catenary wire was run down the office and was drilled into the floor/roof above. The wiring could then just be run along the catenary wire and was just cable tied in various places to support the wire and keep it clean and out of the way. Again a small loop of wire was left for each light and a quick connect power point [1] was used to provide power for each light. After running wires the ends were taped up and hidden in the wall until sanding and painting was done and the lights were install straight away since they replace roof tiles. This ordering of tasks was optimal since it prevented removing and working around ceiling tiles, having to redo power points or the painters having to paint around them.

When the data points were connected up to the data cabinet they had to be tested to check that there was a connection on each line. CAT5 cable [2] was used and there are 8 lines in each cable that each match up to a pin on either side. All eight of these had to be checked to make sure that it’s all connected up correctly. To do this on one end there was a machine sending a signal through each of them one at a time and on the other end a receiver would be there to read the signal and would light up 1-8 if wired correctly. This was also used to label the data cabinet ports so that it was easy to tell which wall socket it matched up to if there were any problems later on.

## 2.2 Major Activity Reflection 2

One duty I had while on my second placement, at Telstra, was doing up polygons for cells without them. Over the Christmas period there wasn’t much new work being done since many employees were on holidays, so this time was taken to clean up the network and fixing up all of the polygons was one of these tasks. Polygons are basically just a map of where the coverage from each cell reaches. This can be seen by running a best server or coverage by RSRP prediction depending on which technology you are doing it for. In my case it was for LTE so I was using a coverage by RSRP prediction. RSRP stands for reference signal received power and is basically just a measure of signal strength [3]. This means that it is dividing up the area of Brisbane by optimal signal strength to show the cell area of each antenna.

Rules I had to follow when making these polygons were that the points had to be drawn in a clockwise direction. There also shouldn’t be too much area covered out to sea, as this can cause problems for other programs that use this polygon data. An example of this would be finding the centre of the cell in the middle of the ocean. The polygon doesn’t have to be completely out of the ocean thought some coverage should be left so that it is known that coverage extends out to sea, but the majority of the polygon should be over land. These polygons should also consist of more than six points, but no more than fifteen and should not be placed such that they create lines that overlap. Most of these rules have been made to accommodate the database that stores this information.

Originally I had trouble with the polygons, the biggest issue being that I couldn’t export them. After conduction some research I found that there was a program file that needed to be edited after installing Atoll. This allowed an add-on to become available to export the points of the created polygons. This still wasn’t coming out with cell names attached to the points, so I asked another colleague who directed me one of the managers who had more information on the topic. He showed me the new more efficient way to create them on a large scale by exporting and importing the coverage layer. This method of creating polygons would’ve sped up the task of creating polygons at least 5 times.

This task of creating polygons was done using a powerful telecommunications program called Atoll. It is a program that supports 2G, 3G and 4G technologies and allows you to do an extensive range of tasks for optimisation and design of your mobile network [4]. The process for doing this was importing clutter to account for losses from buildings and terrain and other things then you set up a computational zone and filtering zone around your antennas leaving at least 2 antennas between an antenna of interest and the filtering zone. The filtering zone is used to cut out unnecessary information on the map by excluding anything outside of the zone, while the computational zone is the area atoll will predict in. This shortens the prediction times by cutting out unnecessary antennas and land mass, while keeping enough to run an accurate prediction. To run predictions I used the optimisation clusters that other team members had been assigned to group nearby sites, so that I wasn’t running predictions on individual sites. Next you run the prediction to see the coverage area for each antenna and export this layer. You can then reimport it as an editable layer and then it only has to be fine tuned to meet standards and to fix completely cover the desired area. These points are then exported and uploaded into a live database that Telstra uses called dibbler.

# 3.0 Conclusions

My industry related work experience during the first thirty days gave me a lot of real world experience. Working at both Leggett’s electrical and Telstra gave me the chance to see how the industry is from two different perspectives, as I worked as the person who plans the work and the contractor who has to go and implement the work. I have also learnt many things, such as working to standards to keep customers happy, as well as a lot of telecommunications knowledge and experience. This vacation work has been a great learning experience and complemented the learning I had done at university. It allowed me to apply the knowledge I had gained as well as gaining additional knowledge that was applied to real situations to help me through the rest of my degree and when I enter the workforce again.

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# Appendix 1 – Work Log

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| --- | --- | --- | --- |
| Day | Date | Duration | Work Activity |
| 1 | 25/6/13 | 5 | Put up cable laddering. Helped put up cable and isolators for the roller doors |
| 2 | 26/6/13 | 7.5 | Installed power points around the factory, so that the temporary power could be removed and power could be properly connected. |
| 3 | 5/7/12 | 9 | Marked out where all of the switches, power points and data were going in the office, lunchrooms and bathrooms. Later found out that the switches had to be placed lower to accommodate the possibility of disabled people working. |
| 4 | 6/7/12 | 9 | Started running cables before the roof tiles and walls were put up. |
| 5 | 9/7/12 | 7.5 | Ran data cables from the factory to the road before the concreters came to put paths over where the pipes ran. Hid all the wires in the wall before painters and plasterers came. Went out on some small domestic jobs. |
| 6 | 12/7/12 | 9 | Ran lighting cable using catenary wire and cable ties |
| 7 | 14/7/12 | 6 | Installed emergency lights in the factory |
| 8 | 17/7/12 | 7.5 | Installed the data cabinet and tested connections for all data points. Fitted off power points. |
| 9 | 19/7/12 | 9 | Installed all the high bay lighting and ran cables for them. |
| 10 | 25/7/12 | 5.5 | Installed outdoor lighting and lighting for bathrooms and lunchrooms. |
| 11 | 4/12/13 | 7.5 | Met people in the office, set up my desk. Learnt about LTE. Went out to the gap to uptilt a GSM antenna in response to a customer complaint. Resulted in a 5dB improvement in the signal. |
| 12 | 5/12/13 | 7.5 | Did a weekly report on intermodulation around the Telstra towers, which documents which sites are having problems and how far investigation has gone into the problem. Began setting up necessary programs required for my work. Started doing induction quizzes. |
| 13 | 6/12/13 | 7.5 | Did a quiz on LTE and learnt about the RF plumbing used for the various Telstra antennas. Did some calculations on power being used by the various Telstra technologies. |
| 14 | 9/12/13 | 7.5 | There was a Monday morning meeting which discusses what everyone is working on to keep people up to speed. Learnt how to use RF-Map a Telstra program used for EME analysis. Did more induction quizzes. |
| 15 | 10/12/13 | 7.5 | Started doing EME analysis at one of the Telstra sites. Started by sketching the RF plumbing for each technology on each sector and calculating the power outputted from each antenna. Went to a cluster optimisation meeting, which is where the team discusses progress on optimising their groups of sites. |
| 16 | 11/12/13 | 7.5 | Continued EME analysis. Made a plan for implementing LTE700 and implemented it into RF-Map to see the how it would affect the EME levels in the surrounding area. |
| 17 | 12/12/13 | 7.5 | Continued EME analysis on the same site and began working on a second site. Did the weekly PIM reports. |
| 18 | 13/12/13 | 7.5 | Continued EME analysis on both sites and presented what I had done to my supervisor. Received feedback on what to fix up and how to present it to be useful for others. Set up Atoll a program for coverage predictions. |
| 19 | 16/12/13 | 7.5 | Finished EME analysis of the first site. Fixed up all the discussed changes and put all of my work into a slide pack which compares the levels of radiation of the current and proposed technologies and the new and old standard |
| 20 | 17/12/13 | 7.5 | Started working on polygons for the LTE1800 network. Had to change an atoll program file to export the polygon data. Found the relevant cells and placed a computation zone around the relevant cells. Imported location data, calculated a prediction for coverage by best cell. Exported the coverage area and imported it as an editable layer. Adjusted this layer to fit the coverage and standards set by Telstra. Exported the points and put them into a program that puts them into the right format for the database. |
| 21 | 18/12/13 | 7.5 | Continued working on polygons. Polygons are basically just mapping the coverage of each cell. |
| 22 | 19/12/13 | 7.5 | Started working on EME analysis again and finished off the next site. This site failed EME analysis with LTE700 on it, so it won’t be included in the stage 1 rollout. Did the weekly PIM report. Started working on a third site for EME analysis |
| 23 | 20/12/13 | 7.5 | Continued EME analysis |
| 24 | 23/12/13 | 7.5 | Continued doing EME analysis. Was going to do ACMA registration but I didn’t have access. |
| 25 | 24/12/13 | 7.5 | Did some more EME analysis. This site failed as the EME pattern went straight into the side of the next building even when losses were applied. |
| 26 | 30/12/13 | 7.5 | Did EME analysis on another site and started doing some data alignment checks. Which required a few new programs, DAC and scary spider. Both of which are Telstra programs developed by another engineer on my floor. DAC checks the various databases for data to make it easy to make sure they are the same value. If values don’t match you need to research and use your best judgement to select the correct value. For LTE scary spider can be used to check some values as it shows the live values. |
| 27 | 31/12/13 | 7.5 | Did EME analysis for another site and did some more DACs |
| 28 | 2/1/14 | 7.5 | Did EME analysis on some more sites and went on a site visit to check the measurements I was using for the site that failed were correct. Did some more DACs |
| 29 | 3/1/14 | 7.5 | Did EME analysis on a few more sites |
| 30 | 6/1/14 | 7.5 | Did EME analysis on a few more sites |

# Appendix 2 – Reflective Notes

**Situation:** Need to get wiring to all required places in the office for installations

**Task/event:** To run wires from every light and power point.

**Action:** ran catenary wire in the ceiling and cable tied the necessary wires to that. This kept them off the ceiling tiles and out of the way of air conditioner ducting and plumbing.

**Result:** All of the cables were run for everything before ceiling tiles were put up. They were neat and out of the way to make it easy for future work to be done. All that had to be done was to fit them off once the walls were painted.

**Learnt:**

* This gave me real experience of projects being implemented
* Importance of ordering tasks to make things run smoothly and prevent redoing of work
* Doing work to a standard

***Situation:***There are a large number of discrepancies between databases, which can cause problems if u select an incorrect value for something.

***Task/event:***To use all available information to make a best judgement on correct values

***Action:*** completed a large number of data alignment checks for those who were on leave*.*

***Result:*** Fixed a large number of discrepancies between the various databases that Telstra uses to store important information about their antennas.

***Learnt:***

* Learnt about the various Telstra databases and reliabilities of each with respect to certain values
* Making informed decisions to achieve the best outcome
* Gained knowledge of the mobile network and parameters that influence it.
* Gained knowledge of antennas

***Situation:***There were a large number of polygons that hadn’t been done

***Task/event:***To design the missing polygons for the LTE network

***Action:*** completed a large list of polygons after installing new software and learning how to use it*.*

***Result:*** After asking the correct person about how to do polygons an easy way to a large number of them at the same time. This enabled me to finish them very fast for such a large number of them.

***Learnt:***

* How to use a new software necessary for a wide variety of telecommunications predictions and other tasks.
* Always look for a faster way to do things/ seek advice from more experienced colleagues
* Learnt what polygons are for, how to make them to standard and their importance.
* Design software is a powerful tool that has many useful applications