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THE DPWI ENGINEERING SERVICES CONTINUE TO SAVE MILLIONS OF RANDS THROUGH IN-HOUSE ENGINEERS



public works
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Department:
Public Works and Infrastructure
REPUBLIC OF SOUTH AFRICA



CAPACITY BUILDING EFFORTS BY PROFESSIONAL SERVICES

Capacity Building is an essence of the Professional Services Branch's mandate. Our work is clearly reflected in the knowledge, skills, competence, behaviour, commitment, experience, attitude and values demonstrated by our beneficiaries.

Join us in this Special Edition as we celebrate achievements by our beneficiaries from the Young Professionals, Internship and Bursary Programmes. This is happening against the backdrop of the Economic Reconstruction and Recovery Plan, as we sharpen our efforts to contribute towards the alleviation of Youth Unemployment, Poverty and Inequity.

As we conclude this year, we would like to pause, and celebrate the great strides made by the Engineering Services Directorate in their utilisation of Interns and Candidates.

Enjoy the read as you are appraised on projects designed by these young people, some of them coming through our Schools Programme. We are thrilled to witness them as they progress full circle in their careers.

Bravo to Engineering Services who have indeed put their hand to the plough and are determined never to look back in reclaiming the engineering role within the broad spectrum of professional disciplines.

The Professional Services Branch contributes towards the Department's Strategic Plan Outcome of a "Transformed Built Environment" which is linked to Government **Priority2: "Economic Transformation and Job Creation"** and **Priority3: Education and Skills** of the Medium Term Strategic Framework (2019 -2024).

Our contribution to the transformed environment is through:

- Building internal capacity of the Property Management Trading Entity (PMTE) to further implement the Government Immovable Asset Management Act (GIAMA) and the Infrastructure Delivery Management System (IDMS);
- Leading State technical capacity development through the creation of an integrated and coordinated planning, delivery and funding platform that will provide the line of sight on available capacity, covering the entire skills pipeline;
- Leading and directing the development of technical capacity in the Sector by giving effect to transformation imperative arising from Charters, National Development Plan, Vision 2030, and the Department's mandate.

Our efforts are realised through the use of a capacity building model delivering Skills Attraction Programmes (i.e. Schools Programme, Bursary Scheme, Bursary Care, Job Shadowing, and Vacation Work); Intermediate Phase Programmes (i.e. Technical Internship, Artisan Development, Management Trainee, Young Professionals Programme, Candidacy Programme (for permanent employees) ; and Skills Retention Strategies (i.e. In-House Design Teams, Occupation Specific Dispensation (OSD) Remuneration, Mentorship).

We appreciate the leadership role from our Acting Director-General and the Minister in carrying out the mandate of the programme. We continue to receive invaluable support from the CFO, Regional Managers, EXCO, and all line function managers who provide the essential resources and a platform to develop and grow technical capacity.

To all our Engineering Interns and Candidates featured in this Edition, your achievement is our honour.

**Author: Ms. Vangile Manzini, Chief Director: Professional Services
Professional Services Branch**

**Editorial team: Thozama Mbili, Petrus Sibiya
Pictures: Supplied by the Candidates and Interns
Design & Layout: Tumisang Nisele**



THE IMPACT OF YOUNG PROFESSIONALS (ENGINEERS) FOR IN-HOUSE PROJECTS

The Construction Project Management Branch is responsible for the implementation of approximately 1300 projects countrywide. The number of projects often forces the Department to increase its capacity by appointing external professional consulting companies in developing designs, tender documentation and manage these projects on its behalf.

The calculation of consultant fees normally boards on 18% of the project cost. This has become an acceptable cost for each project as the Department was not able to execute in-house projects due to capacity constraints.

When the Engineering Services (ES) Directorate was established in 2016 as per the approved structure and capacitated by Human Capital Investments (HCI), there was a need to utilise the 'extra hands' in the form of Young Professionals to work on real projects, whilst at the same time gaining experience in design and obtain their professional registrations in the various councils to further their careers.

This decision has led to many benefits for the Department, not limited to the list below:

- Turnaround time on the planning phase of the project is reduced;
- The design accuracy due to no other interest has improved;
- Quality of work being produced ensuring client satisfaction;
- Projects being delivered on time and within the approved budgets;
- The cost of not appointing consultants has generated savings in terms of the projects implemented internally. The savings depicted below are only reflecting on the final detailed designs completed by the Young Professionals. These projects still need to move to the construction phase. The fees saved on the construction phase are not included on this cost.

Total Professional Savings Per Region		
	Total Projects	Total savings
Bloemfontein	17	R53 797 689,18
Cape Town	10	R46 621 661,36
Durban	9	R12 580 483,34
Pretoria	6	R5 133 173,44
Head Office	4	R4 655 373,24
Polokwane	8	R1 925 904,96
Nelspruit	3	R1 655 791,14
Mmabatho	1	R444 500,00
Kimberley	4	R197 250,00
Umtata	2	R117 627,34
Port Elizabeth	1	R36 476,85
Johannesburg	1	R7 800,00
	66	R127 173 730,85

Although the positive strides have been achieved by the Young Professionals Programme, there is more work that needs to be done in retaining the skills and professionals that have been trained in the Department. The CPM Branch will continue to work closely with HCI in ensuring that the Young Professionals receive the experience and exposure they need to succeed as professionals.

*Author: Mr. Wasnaar Hlabangwane
Chief Director: Construction Management*

A ZOOM INTO ENGINEERING SERVICES CANDIDACY PROGRAMME

The National Department of Public Works and Infrastructure (DPWI) developed a new departmental structure through the Department of Public Service and Administration (DPSA) which was approved by Parliament and adopted for implementation in 2016.

The structure has a Construction Management Branch (CPM) of which Engineering Services Chief Directorate (ESCD) is part of. In 2018, the Department was only able to appoint two directors; myself Michael Tladi (Pr Eng) and Mokgobi Ramushu (Pr Eng); Civil & Structural Engineering. Initially, I was appointed for Mechanical Engineering and later requested to also oversee electrical engineering as my qualification background is Electro-Mechanical Engineering. Furthermore, the Department has a Professional Services (PS) branch with Human Capital

Investment (HCI) directorate which is responsible to provide bursaries to disadvantaged background scholars from our communities including engineering candidates and interns. In addition to the HCI duties of providing bursaries, is the provision of job opportunities through the Presidential Stimulus Programme to reduce unemployment in our country as the Coronavirus has affected many of us.

When I analysed the situation for electrical and mechanical engineering services across all regions and Head Office on my arrival, I noted that all electrical and mechanical engineering candidates were outsourced to consulting engineering companies with a purpose for them to gain experience and register as professionals. **In my analysis of the total capacity, the following table provides clarity:**

Number of Professionals	Registered		Legacy System		Candidates	
	Electrical	Mechanical	Electrical	Mechanical	Electrical	Mechanical
Bloemfontein	0	0	0	0	1	1
Cape Town	0	0	0	0	3	1
Durban	1	1	1	1	1	2
Head Office	1	2	1	0	2	4
Johannesburg	1	0	1	0	1	1
Kimberley	0	0	0	0	0	1
Mmabatho	0	0	0	0	1	0
Nelspruit	0	0	0	0	0	0
Polokwane	0	0	0	0	2	1
Port Elizabeth	0	0	0	0	0	1
Pretoria	0	1	1	1	0	1
Umtata	0	0	0	0	1	0

As per Sketch Plan Manual processes, we need to ensure that there is at least DPWI engineer as counterpart to the appointed consulting engineers on each project, but due to the lack of capacity, all counterparts were overloaded with work.

That positioned me to find ways to optimise our performance whilst maintaining service delivery. Additionally, the structure provided more challenges as it does not allow for the appointment of production engineers but chief engineers only, hence it affected the candidate's value adding to service delivery.

I interviewed all candidates, their mentors, and consulted with Regional Managers and director projects to find ways to improve on service delivery for engineering projects.

Prior to my consultation process, I developed Electrical and Mechanical Implementation Structure Plan (EMISP) which included candidates and their roles in projects as project engineers.

I also found that the Department had electrical and mechanical standards and specifications of which some of them were dating back to 1989 published on our website which put the Department at risk when used on projects by consultants. Those documents had lots of technological risk which had a financial risk to the Department.

I took the following bold steps;

1. Enforced all mentors appointed through HCI to sign off in-house projects executed by engineering candidates.
2. Returned all candidates back to the Department to work as project engineers whilst being supervised by registered engineers and legacy engineers.
3. Ensured that as Engineering Services (ES), we develop Engineering Services Candidacy programme (ECP) and sign an agreement with HCI. This document outlines HCI responsibilities and ES duties to ensure that candidates report accordingly and receive required experience.
4. Enforced the development of In-house Design Manual (IDM) which is a parallel document to Sketch Plan Manual (SPM) used by appointed consultants. This document ensures that 10% of the work is executed in-house by candidates and 90% of the work is still executed through consultants using SPM processes.
5. Due to challenges faced, I requested the appointment of 4 Architects through the Presidential Stimulus Programme to work only on in-house projects.
6. Developed Engineering Services Operational (ESOP) Structure which focuses on the production of engineering designs/drawings, reports, etc. as per IDM documentation and balances the work received for SPM.
7. Implemented annual Engineering Services Technical Review to ensure that all candidates are compliant with ECSA requirements to register as professional engineer/technologist/technicians.
8. Degraded my operational level to Chief Engineer to supervise candidate's work, quality of work and speedy response to Director Projects or requests received.
9. I developed project tracker for each candidate and engineering staff members which is used as an additional measure for projects performance.
10. Ensured that each candidate working on in-house projects records professional savings and align their work activities with the CPM branch performance plan.

The above activities are some of the innovations I brought in the Department for Engineering Services to enhance performance. However, not everything will go as planned. Thus we had challenges with procurement of softwares due to software expiry of AutoCAD (expires annually). As a result, we used different software trial versions after a failed attempt to get AutoCAD trial version. Fortunately today we have adopted ZWCAD software which doesn't expire, but require updates after a few years. We are still waiting for the procurement of Prokon (Structural) and civil CAD software.

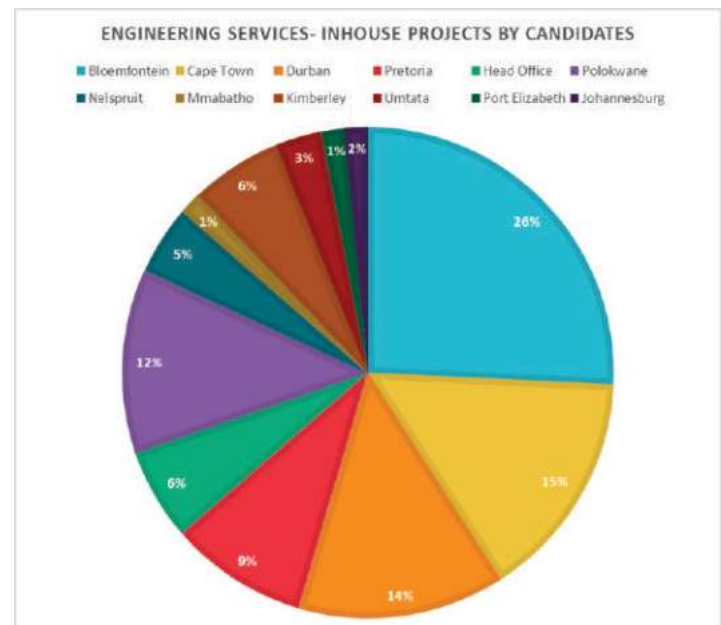
We all know that as government across all departments, there are challenges with finances due to the Coronavirus which impacted social economics in our communities and these candidates have saved the Department and departmental clients **R127 173 730,85** professional fees savings on **66 projects** which are on **Detail Design Stage** through the IDM process. From next year, as soon as the contractors are appointed on these projects, each project engineer as a candidate will be exposed to resident engineer responsibilities.

After having applied these innovative methods across all ES disciplines, **the following candidates qualified using in-house projects;**

Full Name	Year
Shane Palackal (Pr Eng)	2020
Lindokuhle Phungula (Pr Eng)	2020
Kabelo Chabalala (Pr Eng)	2020
Horisani Madzivhane (Pr Eng)	2021
Nozandi Njomi (Pr Techni)	2020

NB: Engineering Services is planning to register 13 candidates in 2022 through in-house projects.

Below is the pie chart showing the involvement of structural, electrical, mechanical and electrical candidates supported by 4 appointed Architects. These projects are on Detail Design Stage.



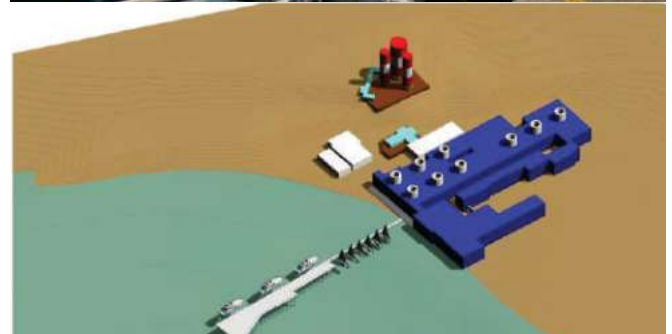
As per the final figure above, here is the breakdown of professional fees saving achieved by Engineering Services Chief Directorate through the involvement of candidates:



DPWI OFFICES	% SAVINGS
Bloemfontein	42,30%
Cape Town	36,66%
Durban	9,89%
Pretoria	4,04%
Head Office	3,66%
Polokwane	1,51%
Nelspruit	1,30%
Mmabatho	0,35%
Kimberley	0,16%
Umtata	0,09%

In conclusion, the Department of Public Works and Infrastructure (DPWI) might have faced challenges during this phase of the Coronavirus pandemic, but I believe that these candidates have uplifted the hopes of many of us as DPWI public sector engineers and architects, that we can do it and be proud of our work, hence I proposed this Engineering Services Special Edition to be published and for the Engineering Services In-house Expo to be hosted. This in order for the candidates to take pride in their work and be rewarded by being recognised in service delivery whilst being on their road to register as professionals.

Author: Michael Tladi (Pr Eng), Electro-Mechanical Engineer



MEET JUNIOR ELECTRICAL ENGINEER SIMVUYELE MDEKAZI



Ms Simvuyele Mdekazi is based at Head Office in Pretoria. She joined the Department of Public Works and Infrastructure (DPWI) in April 2021 as an Intern.

She is one of the students who were part of the DPWI Bursary Holders Programme and she began her Internship after completing her university studies. “I am currently appointed as an Intern as I was waiting for my Engineering Council of South Africa (ECSA) candidacy certificate which I received in October. I completed my BSc (Eng.) in Electrical Engineering at the University of Cape Town in December 2020. This was made possible by the funding and support that I received from the DPWI throughout my university studies, and which I'm eternally grateful for,” explains Simvuyele.

She says she seeks to complete the Internship and upgrade to the Candidate Programme in record time. “Since I am working as a junior engineer, I hope to have gained as much knowledge as possible in electrical building services, within this Internship Programme,” she added. Simvuyele says her job includes the

maintaining, upgrading and design of electrical systems for state-owned buildings and departmental clients such as the Department of Correctional Services (DCS), the South African Police Service (SAPS) etc.

She takes us through her current responsibilities; “I work on electrical systems like power supply to the facility (both main grid and back-up power), Distribution Boards, small power (socket outlets, isolators etc.), fire detection, lighting and security system. My responsibility is to partake in work that meets the requirements of ECSA outcomes so that I can successfully register as a professional. This includes solving professional technical problems through the analysis of information from different sources and levels where judgement is required to evaluate best course of action. I'm also involved in the updating of the electrical departmental specifications and standards including Energy Efficiency Plans, to assist the Department in energy cost reduction in buildings.

“I am currently working on 7 projects and I saved the Department R 955 757.77 in professional fees. My favourite project so far is the refurbishment of distribution boards, cabling and wiring, socket outlets and lighting for Musina Magistrate's Court. This was an exciting project since I was exposed to practical engineering of which I have never experienced in varsity. I am thankful to my immediate supervisor Tshepo Msimanga for providing support and for transferring all the required skills and knowledge.

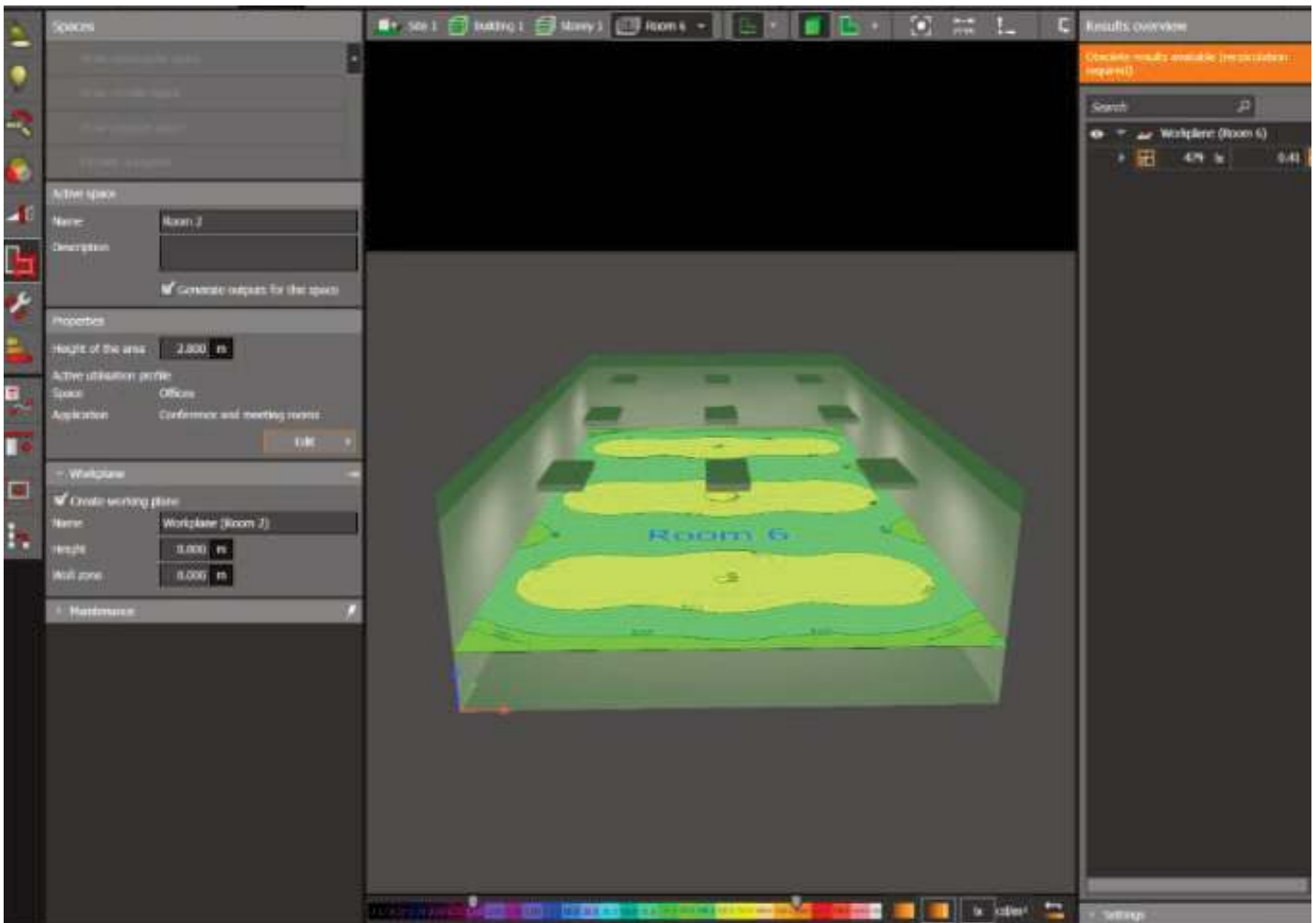
“The facility is supplied by a 125A from the local municipality as the main grid supply and a backup generator of 88kVA which feeds the whole facility during power outages. Most DBs were stripped off with no cover plate, some had obsolete circuit breakers. The Distribution Boards (DBs) were non-compliant, dangerous to the users of the facility. The design I implemented was to refurbish the DB by rewiring, installing new circuit breakers, labelling and putting covers on the DBs.

“There were insufficient socket outlets which leads to the use of multiple extension cords. Some of the socket outlets were deteriorating and non-functional due to faulty wirings. Some of the sockets in power skirting were hanging and loose. The solution I produced was to design additional socket outlets and also repair the existing such that they adhere to specifications of SANS 164.

“The existing light fittings on site were fluorescent luminaires. My design had a retrofit of all luminaires to new LED fittings. The advantages of using LED fittings is that they have high brightness and intensity, have a long life span, they do not produce toxic gases and they are energy-efficient.

“For lighting design, I used first principle calculations to know the number of light fittings (72W LED Panel) hence I knew how many should be installed in a courtroom. The result showed that 9.7 luminaires were required for the room. I then ran simulations of DialLux to check whether the calculated results were going to match the simulated one. The results of simulation was 9 light fittings which is within the range of the

first principle calculation. Therefore, the results of both methods match. I made simulations for all the rooms using specific requirements as per SANS 10114-1. I then exported the lighting design to CAD software and I also included wiring, light switches, motion sensors and circuits (As per SANS10142-1). **The illustration below show simulation results due to my calculations;**



Lighting design calculations and a Dialux lighting simulation for a single room

“I have learnt the ability to identify and solve engineering problems. I also implement solutions which manages impacts of engineering activities like social, environmental etc.

“I call myself a “Public Servant”, solely because I am grateful to be part of the team which works so hard to ensure that good quality engineering work is delivered by the Department for

the nation. I am proud that within a short space of time after having joined the Department, Engineering Services has exposed me to real world engineering problems and solutions within the in-house design processes. Having said that, I note that my career path is waiting for me in excitement; as I make my way to registering as a professional engineer.”



MEET CANDIDATE MECHANICAL ENGINEER SLADE HODGE

Mr Slade Hodge is based at the Johannesburg Regional Office. He joined the Department of Public Works and Infrastructure (DPWI) in June 2020 as an Intern.

He is one of the students who were part of the DPWI Bursary Holders Programme and he began his Internship programme after completing his university studies. “I transitioned from Intern to Candidate Engineer in July 2021. I hold a four-year Bachelor's Degree in Mechanical Engineering (BScEng-Mechanical) from the University of the Witwatersrand. My short-term career goal is to learn as much as possible in order to broaden my understanding and expertise in a variety of applications, as this will allow me to perform a wide array of tasks that may be required by future projects,” Slade explains.

He says his work at the DPWI entails mechanical design on current projects. He adds that he is a newly-appointed Candidate Engineer and as such he has not yet learned all areas of mechanical design typically required in projects. “I have learned a good amount of wet services design so far, and will be moving to fire protection and air conditioning design soon. Wet services design involves designing and optimising the layout of all piping to wherever hot or cold water is needed, doing demand calculations to determine the pipe sizing requirements and specifying hot water equipment that should be installed to meet hot water demands,” he adds.

Slade takes us through the project that has stood out for him; “So far I have only worked on two projects, so choosing a

favourite is a simple task. The Thabong SAPS Training Academy is my current project and also my favourite because I have been given the responsibility of doing the wet services design. So far this project has taught me a lot about the thinking behind the design and how the design should be best optimised to ensure the requirements are adequately met, as well as keeping costs down and designs simple. A recent site visit taught me how designs sometimes need to be adjusted to what is already installed. For example: some of my design's pipe layouts need to change because the thick concrete walls of the building make it difficult to drill and install pipes where they were originally intended. I needed to learn to work with the existing layout to make installation cheaper, more practical, and quicker.

“Towards my goal of registering with the Engineering Council of South Africa (ECSA) as a professional, I have learned how to apply technical knowledge and do design work for a project. I have learned the importance of clear and open lines of communication between different parties working on a project – particularly between the various engineering disciplines and the architect. I have also learned how the client requirements do not necessarily line up with my recommendations based on engineering calculations and my designs need to be adapted to make sure the client's needs and requests are met while maintaining a functional system that conforms to all necessary standards and specifications.

“It has been an enjoyable experience applying the knowledge gained in my studies.

Many public facilities are in dire need of new mechanical systems to improve the quality of the experience for those who live and work there, and knowing that my designs directly help the quality of these peoples' day-to-day experiences, is very rewarding.

“My current project requires the calculation of pipe sizes so that all water outlets have a good flowrate with laminar flow. Another calculation that needs to be done is to calculate how much hot water is needed and what equipment is needed to provide it. According to the SANS 10252-1 standard, hostel type buildings require 80-120 litres of hot water per person per day and to have 30-35 litres of hot water per person per day stored at any time. For a section of the Academy (block A), there are 14 people staying in rooms per floor and there are two floors.

“The hot water system for ground and first floor should be separate so that they can be shut off independently of each other.

Demand: 28 people @ 100L = 2800L total hot water per day.

Hot water storage: 14 people @ 35L = 490L of stored hot water per floor.

“The client indicated that I should use 200L geysers for hot water storage so that means three 200L geysers are needed per

floor. Using a heat pump to heat the water is about three times more efficient than using the elements inside the geysers so the amount of heat required to heat the 490L of water needs to be calculated so that the right size heat pump can be selected to be installed.”

$$\text{Power required} = \frac{\text{Mass flow rate} \times \text{Heat Capacity}}{\text{Temperature increase}}$$

The mass flow rate is calculated using the number of litres (490L), the density of water (water is easy because one litre of water is also 1kg of water) and the time over which the water should be heated. A time of three hours was used for the calculation. This leads to a mass flow rate of 163.3 kg/hour 0.04537 kg/s. The heat capacity of water is 4.186 kJ/kg.°C which means that it takes 4.186 kilojoules of energy to heat one kilogram of water up one degree Celsius.

The temperature increase is the heating of water from its coldest average temperature in winter to the required 60°C. The coldest average temperature was taken to be 2°C for this calculation.

Thus, the required power works out as 11.02 kW and means that this is the required heating capacity of the heat pump that should be installed per floor to heat the water that is stored in the three 200L geysers.

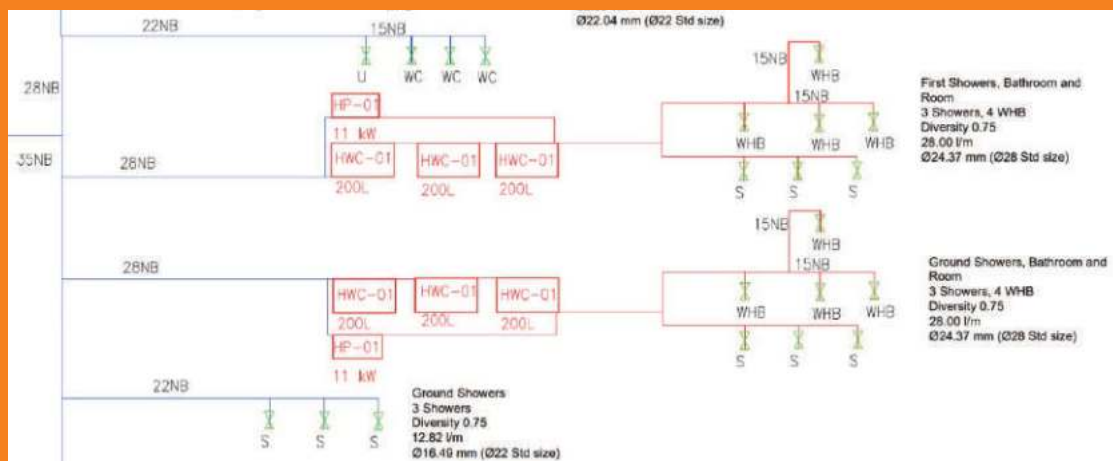


Figure 1: Section of the Process and Instrumentation Drawing showing the layout of the hot water system

“Thanks to in-house design work, the Department is able to save on professional fees. On the two projects I am involved in, the total estimated cost is **R 2 854 166.00** and the professional fee savings total is **R371 041.63.**”

Slade concludes by revealing that he is proud of how quickly he is learning about Mechanical design within the Department and appreciates the opportunity to share his experience with the DPWI family.

MEET PROFESSIONAL TECHNICIAN NOZANDI NJOMI



Ms Nozandi Njomi is based at the Mthatha Regional Office. She joined the Department of Public Works and Infrastructure (DPWI) in December 2017 under the Young Professionals Programme. She says in order to gain experience for her professional registration as a Candidate, she was seconded to a consulting firm in 2018, but returned to the Department in 2019 and began doing the work that added value towards her professional registration.

Nozandi holds a Diploma in Electrical Engineering from the Walter Sisulu University. She says she obtained this qualification in 2015 and in 2016, she registered with the Engineering Council of South Africa (ECSA) as a Candidate Technician.

She says in the Department, she had a team that was strategically placed to assist her within a period of 3 years, to register as a Professional Technician using in-house projects. Nozandi says Michael Tladi supervised her and she received support from many colleagues including Frikkie Lotter, Shane Palackal who was also a Candidate at the time, Moganum Govender and Tshepo Msimanga.

“Under their supervision, my work entailed; cable sizing, lighting design and generator sizing. I eventually got my registration as a Professional Technician through in-house projects. Furthermore, I was motivated to further my studies. I obtained my Professional Registration in February 2021 and my B-Tech in May 2021.

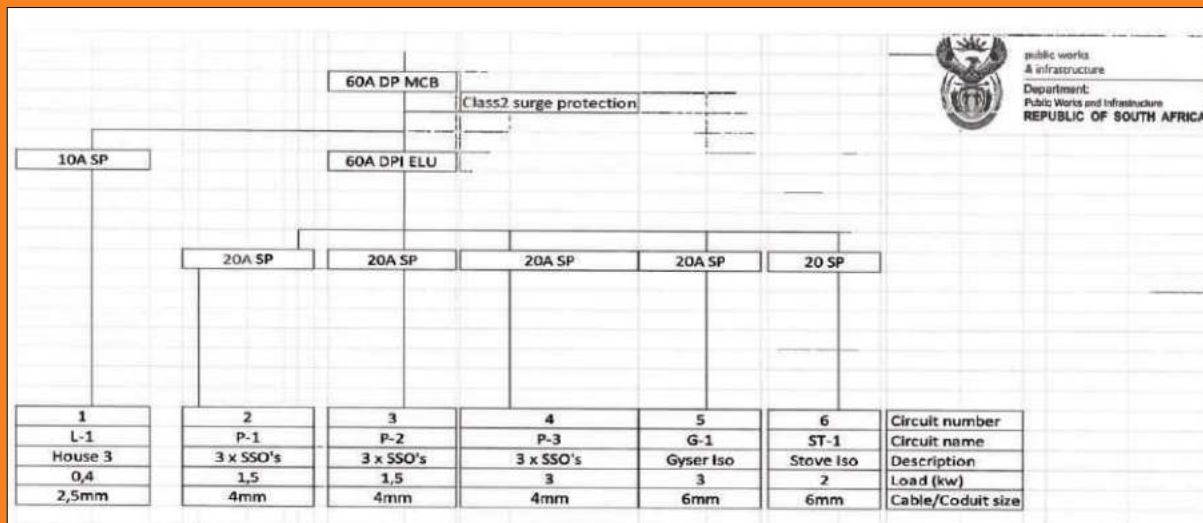
“I'm currently working as an Electrical Technician with the intention to register as a Professional Technologist. There are

plans for me to be trained to design more complex electrical engineering services in 2022.”

Nozandi says out of the projects she has been involved in, the Mthatha Prison and the Department of Justice Thaba Nchu burnt house stand out as she used these two projects to register as a Professional Technician. “For the Mthatha Prison project, I used my engineering knowledge at a Diploma level to determine the size of the generator and the cable size.

“The maximum current drawn by the facility is 649A as recorded on the panel. The total load required by the facility is 449.1kVA [381.74Kw at 0.85 power factor] and 10% was added for future requirements. Therefore, 500kVA stand-by generator is recommended for Mthatha medium prison. I ensured that generator protection is provided for overload, high engine temperature, over speed, etc.

“In order to reduce the voltage drop, I decided to put the generator closer to the electrical kiosk. Having learned during my theoretical and practical lessons that voltage drop increases due to long cables, this was the best solution.



For Thaba nchu burnt house, I did load calculation and single line diagram (SLD) as shown;

Luminaire data		Equipped with	
Luminaire efficiency	: 76.46%	Quantity	: 1
Luminaire efficacy	: 79.4 lm/W	Designation	: 24V
Classification	: A80 ↓100.0% ↑0.0%	Colour	:
CIE Flux Codes	: 93 98 100 100 76	Luminous flux	: 2700 lm
UGR 4H 8H	: 14.7 / 14.7	Colour reproduction	: 1 B
Power	: 26 W		
Luminous flux	: 2064.4 lm		
Dimensions	: 600 mm x 30 mm x 0.0 mm		

Further to the task, I was expected to use Relux lighting simulation software of which the results are shown;

“The above in-house design projects resulted in me getting my ECSA professional registration and I learned that with dedication, hard-work and great supervisor support, the Departmental Candidates can qualify on record time. The Mthatha Regional Office has less complex projects, however, my supervisor ensured that I work in other regional projects

such as the Bloemfontein Office where I am able to gain more experience and add value with a purpose to serve my country with my professional skills. Obtaining my professional status is the accomplishment I am most proud of.”

Meet Candidate Structural Engineer Babalwa Lekganyane



Ms Babalwa Lekganyane is based at the Johannesburg Regional Office. She joined the Department of Public Works and Infrastructure (DPWI) in 2018 under the Young Professionals Programme.

She holds a Bachelor's degree in Civil Engineering from the University of Pretoria. "I was seconded to another company in November 2018 to January 2020, then again from August 2020 to May 2021. I'm currently back at the Department doing in-house projects. My main goal is to obtain my professional engineer status with the Engineering Council of South Africa (ECSA)," Babalwa explains.

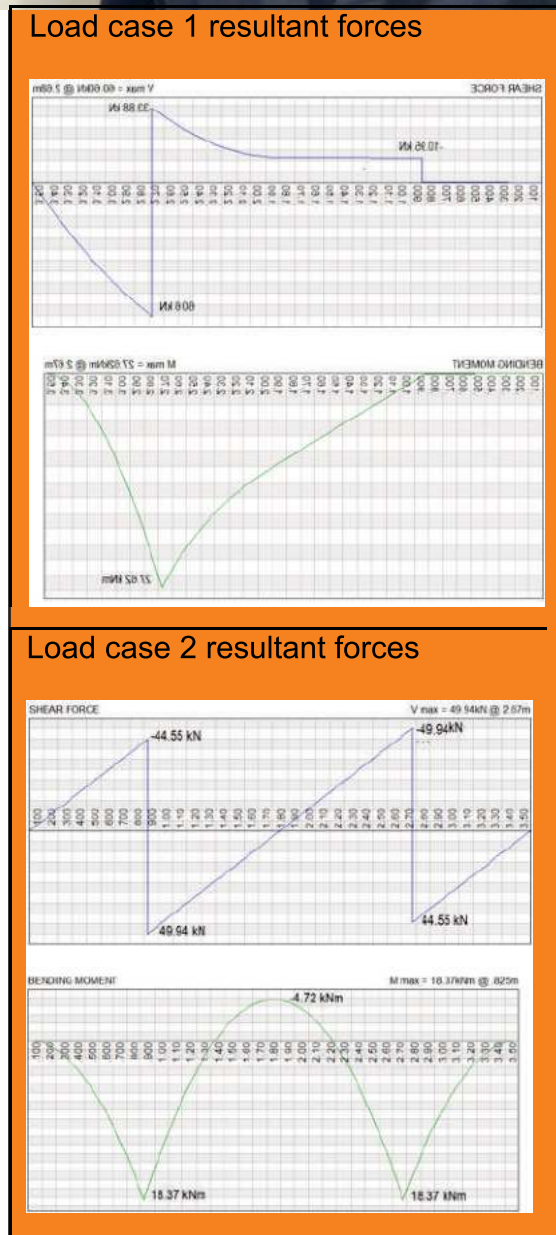
Babalwa says her responsibilities currently involve varying projects in her field of structural engineering. She adds; "This would include repairs and renovations of our National Government's fixed assets, in-house designs of new National Government structures around the country and construction site supervision and inspections."

She takes us through the project that stands out for her; "I have 8 projects that I'm currently working on and in the execution of these projects, the Department has currently saved approximately R5 415 927 in professional fees. My favourite project is Phuthaditjhaba Magistrate's Court in the Free State.

"The client requested for the construction of a new elevated water tank. As the structural engineer on the project, my responsibilities includes the design of the concrete foundation base as well as inspection during construction, thus being exposed to be a resident engineer."

The proposed tower will be elevated above a 15m steel support structure, which will be supplied by the contractor, including the prefabricated 13.8 m³ steel water tank.

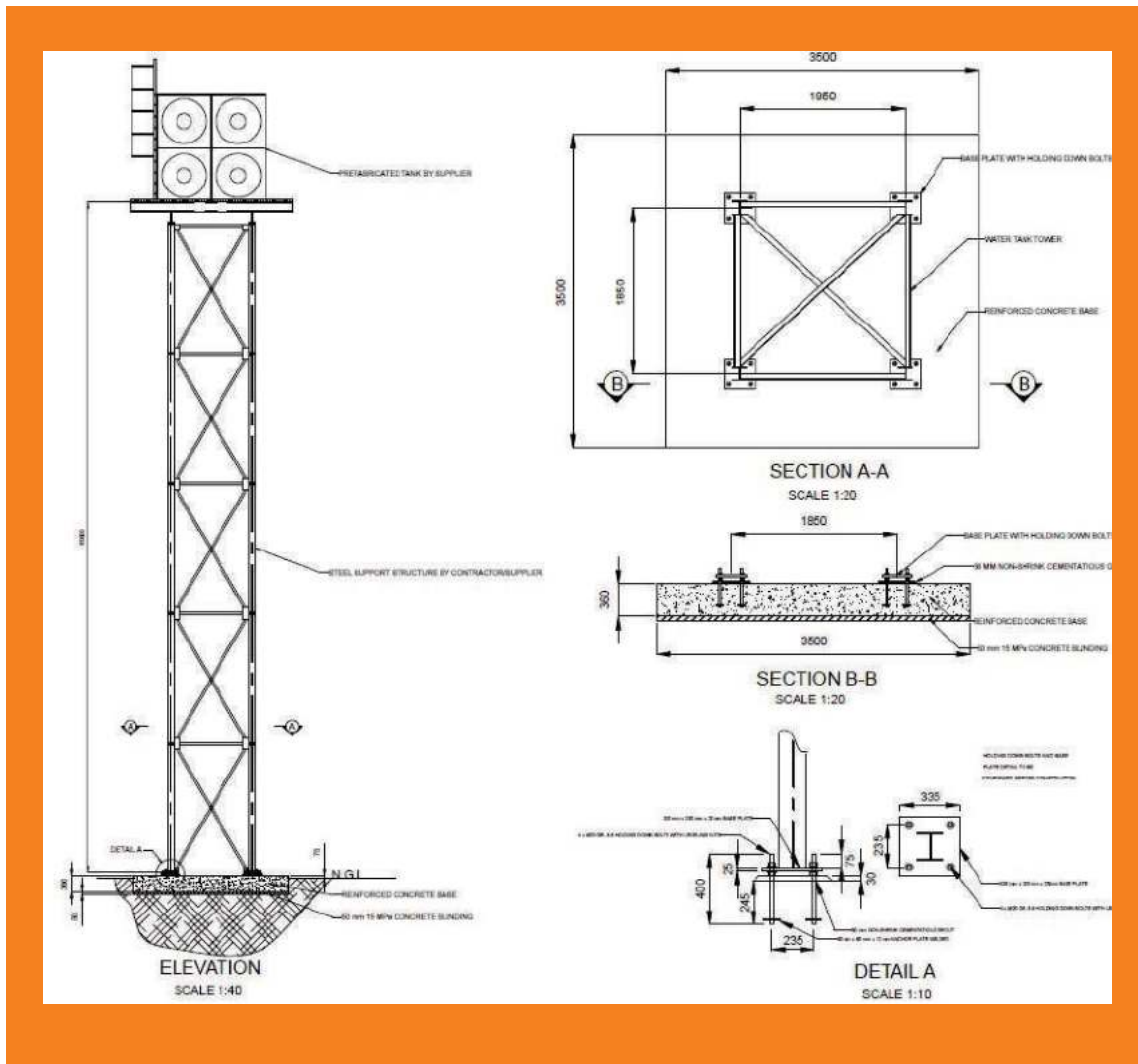
"I did my design using semi-restricted software as well as first design principle calculations. The simulation results of my loads and reactions from the software enabled me to design my reinforced concrete base foundation. The reaction outputs gave two critical load cases and I needed to consider these for my calculations. And these were the resultants:



"I did stability checks on the foundation to determine the workable size of the foundation and the resultant forces to

determine the reinforcement required in the concrete base in order for the base to carry all the loads on it.

Below is a general arrangement of the concrete base;



"From this project I learnt that with any design, there are many alternatives to solve a problem and theoretical solutions are never the same as real world solutions. For me this taught me that I have to work through as many alternative designs as possible to find the best result. Additionally, this project had assisted me to meet some of the expected ECSA outcomes as I prepare to register with ECSA.

"I feel honoured that I am able to contribute to our economic growth by being part of in-house projects initiative as well as delivering reliable and lasting services to our country, and being able to monitor that those same services are provided by

external service providers. Being provided the opportunity to mostly work independently, with some supervision from Horisani Madzivane, Pr. Eng. and mentor, Trevor Mathabatha, Pr. Eng. is one of the accomplishments that I am most proud of.

"This included providing solutions to complex engineering problems. I am proud of my growth while working in-house in the short period after coming back from secondment from other companies, where I was not given the opportunity or responsibility to run my own work."



MEET CANDIDATE ELECTRICAL ENGINEER MOGANUM GOVENDER

Mr Moganum Govender is based at the Bloemfontein Regional Office. He joined the Department of Public Works and Infrastructure (DPWI) in 2018. "I saw the advert for the Candidacy Programme in mid-2017 and decided to apply for the position of Candidate Electrical Engineer as I thought that DPWI, which deals with infrastructure projects, will give me the necessary experience in order to register as a professional. I completed my BSc: Eng. (Electrical) Degree in 2016 at the University of KwaZulu-Natal. In 2017, I registered as a Candidate Engineer with the Engineering Council of South Africa (ECSA).

"My short term career goal is to become a professionally registered Engineer with ECSA. When you are professionally registered with ECSA, it means that you are certified competent in your field and gain public confidence, international recognition, and marketability and peer recognition. Being professionally registered opens up doors to new opportunities," explains Moganum.

Moganum says his main job responsibility as an Electrical Engineer within the Department is designing the electrical infrastructure of projects that are done in-house from the inception stage to close out. These stages involve, investigation of existing facilities, identifying problem areas, providing option-based solutions, budgeting,

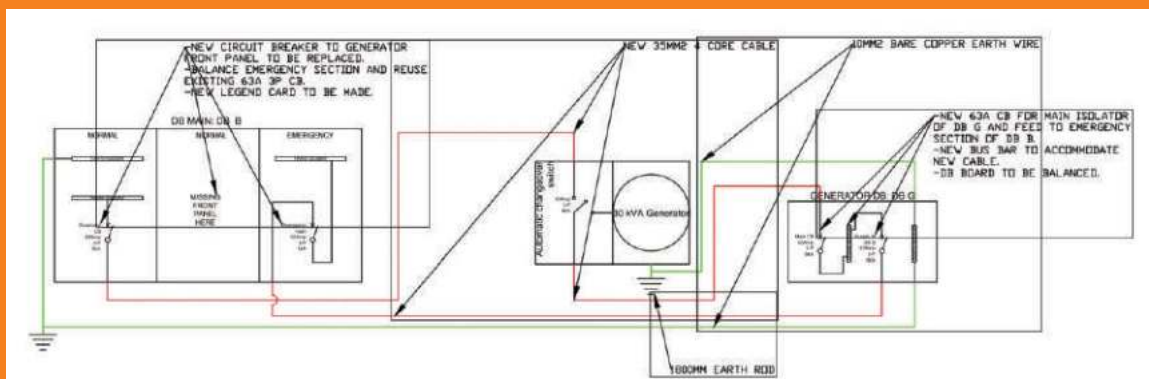
planning, etc. He says In-house projects utilise internal Departmental Engineers instead of procuring services from consultants. This results in skills development of internal engineers and also saves the Department money. He adds that apart from designing, he also reviews consultant's designs to ensure that the designs are in line with Department's standards and client requirements. He expands on the projects he has worked on; "I have done 15 in-house designs in the Department and have saved the Department R 1 072 289, 06 in professional fees. One of the designs that I did was for the installation of a generator at Namahadi Police Station. I was tasked with investigating the replacement of an old existing generator.

"I had to do a load analysis for the building to determine the required size of the new generator, calculate the cables ratings in terms of current carrying capacity and volt drop, determine what can be reused on site to save money on the project, etc. What set this project apart from others is that it is where I started to learn on what it means to be a project engineer/principal agent. As I was the only engineer on the project and had to report progress to the project manager, I had a lot of responsibility on this project.

"One of the lessons I gained from the project was the management of works, which are related to the Group B outcomes of ECSA. As I indicated, I was solely responsible for the technical aspects of the project. I had also gained experience in terms of non-technical regulations, such as determining where the Expanded Public Works Programme (EPWP) can fit into my project. My project has a social impact in terms of providing jobs to the local community, so this also relates to impacts of engineering activities which is outcome 6 of the ECSA outcomes.

"It is a great feeling to be providing my engineering skills to my country. Usually, engineering skills are provided by the private sector on projects, but with the initiatives within the Department, we now have those skills internally to do projects. I am happy that the Department is investing in skills development of the youth in this country and it does bring hope for future generations.

This is my design for this project



"What I am most proud of is the work ethic that I have developed. When I came into the Department I was reliant on others for supervision, but now with all the experience that I have gained, I can

operate on my own with little supervision. This accomplishment is the stepping stone to becoming independent and professionally registered."

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