



2021 EC SA
FEMALE ENGINEERS
DIGITAL BOOK

Achieving an Equal future



ECSA

ENGINEERING COUNCIL OF SOUTH AFRICA

FEMALE ENGINEERS

2021





*Refilwe
Buthelezi*

Achieving an Equal Future

On 09 August 1956 about 20 000 women marched to the Union Buildings in Pretoria to protest against legislation aimed at tightening the apartheid government's control over the movement of black women in urban areas. These women fought with courage, boldness and spoke out on matters that affected them, including inequality, prejudice and freedom of movement.

Sixty - five (65) years later on 09 August 2021, South Africa will commemorate Women's Day under the banner "**Generation Equality: Realizing Women's Rights for an Equal Future**". The generations may be different but the challenges faced by women particularly regarding gender equality continue to place women on the back foot, especially in industries that are male dominated such as the engineering sector.

According to an article published in 2020 in the Global Citizen, only 13% of the Science, Technology, Engineering and Mathematics (STEM) graduates in South Africa are women. This has an impact on the number of women that are available and will be available in the near future to take up roles in the engineering profession in our country. Moreover, only 1 in 5 engineers in South Africa are women and continue to earn significantly less than men do. This is deterring young women from pursuing careers in the field, keeping the status quo intact and thereby resulting to an under representation of female engineers in leadership positions.

However, despite these drawbacks, the number of female Registered Persons by the Engineering Council of South Africa (ECSA) as a regulator continue to rise year on year moreover, the representation of females on the Council has increased with 49% of the Sixth Term Council members being women.

The number of female Registered Persons in the 2017/18 financial year was standing at 2252, at the end of the 2018/19 financial year, the numbers were at 2328, showing an upward trajectory and at the end of 2019/2020 females registered in the professional category increased to 2400. In addition, the female candidate engineer's registrations have increased from 5402 in 2017/2018 to 8905 at the end of the 2019/2020 financial year.

These strides although small but they are a significant addition to the

achievement of the 2030 Agenda for Sustainable Development, where at its heart lies the 17 Sustainable Development Goals (SDGs), and pertinent to the commemoration of women's day is **SDG 5- Gender Equality**.

This SDG acknowledges gender equality as not only a fundamental human right, but also a necessary foundation for a peaceful, prosperous and sustainable world. SDG 5 speaks on achieving gender equality and empowering all women and girls and one of the targets to this goal is to ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life.

In this publication, we profile females who speak to the steady achievement of this SDG. These are female engineers who are catalyst of change, who contribute daily through their work to growing the profession and see a greater representation of female engineers.

These are the registered female engineers whose efforts to promote gender equality have come a long way in gaining attention, but they also realise that more needs to be done by the industry at large and more so the regulator in ensuring key partnerships are formed with relevant role players who will contribute to gender equality in the sector.

Enjoy the read.

Refilwe Buthelezi Pr. Eng
ECSA Vice President



Abimbola
Olunkule

Can you provide a brief outline on your professional background?

I am a Professional Engineer registered with the Engineering Council of South Africa.

I have experience in the Civil/ Structural and Water engineering industry with technical experience gained in the preliminary and detailed design of reinforced concrete structures (water retaining structures, office buildings, foundations), structural steel structures, site supervisions, client liaisons and management.

I hold the following degrees with over 10 years of experience:

- Executive Master of Business Administration (completion Dec 2021).
- MEng Masters in Engineering Management (Golden Key).
- BEng (Hons) Structural Engineering.
- BEng Civil Engineering (First Class).

What motivated you to pursue a career in the engineering sector?

It has always been my attraction for numbers growing up, my interest for how things fit together and function has always driven my curiosity to buildings, bridges and structures in general, hence a career in civil engineering with my specialisation in structural engineering.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

Some of the key highlights in my career include the flagship projects I have worked on, the award I received from ECSA as the Best Registration Professional Assessor for the year in 2018 as well as currently serving as a council member of ECSA. On the academic side it was receiving my golden key award for excellent academic studies.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

The concept of the glass ceiling has been present over the decades and is still present in today's professional engineering industry, this I must say has been one of my key challenges within the industry facing female engineers.

Other key challenges are the lack of female engineers in leading roles within the industry as well as the general undermining of female engineers. This in some cases results in female engineers leaving the industry or being forced to work harder than their male counterparts in order for their work to be acknowledged.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

It is imperative that the regulator drives gender parity in the industry across all levels. The regulator needs to promote, drive and be at the forefront of the change. Moreover, the regulator needs to offer female retention strategies within the industry, provide support and a voice to the female engineer.



*Bernadette
Sunjka*

Can you provide a brief outline on your professional background?

I am a Senior Lecturer in the School of Mechanical, Industrial and Aeronautical Engineering at the University of the Witwatersrand. My qualifications include a PhD degree in Industrial Engineering in the field of Supply Chain Risk Management, two masters degrees in Industrial Engineering (MSc Eng from the University of the Witwatersrand) and Applied Ethics (MPhil from St Augustine College) and a BSc Eng degree in Mechanical Engineering from the University of Kwa-Zulu Natal. I am a Professional Engineer (PrEng), a Professional Project Manager (PMP), a member of the South African Institute of Industrial Engineering (SAIIE) and a member of the Project Management Institute (PMI).

What motivated you to pursue a career in the engineering sector?

My Dad was a Mechanical Engineer registered with ECSA and a lecturer. I used to type his exam papers when I was in high school and the mathematical and problem-solving nature of engineering appealed to me. I also read James A Michener's book "Space" and becoming a NASA engineer inspired me.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

My term serving as the Head of the Mechanical Engineering Department at the then Mangosuthu Technikon (now MUT) in Umlazi was a unique and fulfilling experience. I am honoured to serve as Head of the Industrial Engineering stream in the School of Mechanical, Industrial and Aeronautical Engineering at Wits. Obtaining my PhD was a life-long aspiration and was a significant career and personal achievement.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

Women in the engineering sector are a minority in a male-dominated field. This causes undue stress in

trying to fit into a male-orientated culture of working, where women may face gender discrimination or harassment. Stress can also be subtle, where women may feel that their contributions are less valued than those of their male colleagues are, because tasks and roles are perceived to be male specific. This in turn leads to women feeling that they are not good enough for their respective positions, leading to massive self-doubt.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

My experience in becoming a Professional Engineer is that it somehow provided me with a sense of loyalty towards the profession. I feel a greater responsibility in maintaining the quality and integrity of the way in which I work and how I impart this to the younger generation. As an academic, this inspires me to give my students the best education I can so that the next generation is set up for success and will hence continue to build our country.

I also sense, based on feedback from my past students, that women in the profession act as role-models and mentors for younger women in the profession. ECSA can perhaps leverage off this sentiment to promote the profession and registration among women.



*Christa
Fourie*

Can you provide a brief outline on your professional background?

I studied BEng (Civil) at the University of Pretoria 1994-1997. During my studies I did my experience training at V3 Consulting Engineers. I received a bursary from them and following the completion of my studies, I joined their Bloemfontein office's Transport Department. I recall drawing cross sections for a racetrack in Welkom by hand and using a planimeter to calculate areas to determine volumes in those early years.

In November 2003, I joined Stewart Scott's Bloemfontein office. I had the privilege of being part of strong local team and

we worked together on several SANRAL, ACSA and provincial projects. After 15 years the local office closed due to the current economic situation. Since then, I have done part-time consulting and started with community work, including disaster management of veld fires. I also became actively involved in ECSA's evaluation of Engineering applications.

What motivated you to pursue a career in the engineering sector?

A poster on the wall of my career guidance class in high school. I was looking to venture in a career that was mentally challenging and one that still had the capacity to give the opportunity of working outside of an office. I ended up working mostly in office and enjoyed the work.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

We have been appointed by SANRAL for the Bloemfontein Airport Interchange onto the N8 east of Bloemfontein. The initial tender allowed for a 15-18 month construction period. Due to budget constraints, it was not awarded. 13 months before the Soccer World Cup kick off, funds were available

and after negotiations the project was awarded with a 12-month construction period with no room for any extension of time, as it was a gateway to the Bloemfontein Soccer World Cup Events. The day we opened the interchange, I shifted some of the delineators away to let the first car through, the driver was smiling, hooting, and waving hands in celebration. That was tremendously rewarding after 12 challenging months.

Another highlight was receiving the 2013 Bloemfontein ACSA Feather Awards for:

- Continued Support and Excellent Service Consultant
- Airport Managers Award - The latest highlight was when I used my engineering skills in a disaster management situation and mitigated the impact of an extreme risk to our community.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

It depends a lot on your perspective of the roles of both parents in the family. We have four girls. I wanted to be actively involved in their lives and support them to grow up and fulfil their full potential. I also felt that I should support my husband so that he can exceed in his work. He also has a professional occupation

and is a loyal and active father. It was however challenging when we were both out of town with work appointments for a few days and in some instances where when you need to fly to Johannesburg to get a child admitted to hospital for tests, or when you get an urgent site call that changes your whole afternoon schedule and you cannot keep to a promise to your child. These can be conflicted roles that causes internal conflict which must be dealt with.

The company I worked for was accommodating and gave me the flexible opportunity to work reduced hours and either work from home or from the office since 2010. I still had some long workdays and I still had to travel when projects demanded it,

but that allowed me to improve my work-life balance.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

I believe that, in general, woman engineers are amazingly effective, detail orientated, can multitask and are perfectionists (that is both a strength and weakness).

Most of the women I meet along my career tend to have these characteristics, I cannot tell whether it is a representative sample of the industry.

The Civil Engineering scope of work opportunities is so vast that there

is room for these skills in different positions and women should seek positions and develop in areas that will allow them to accommodate their own family role perspectives. Some might not want to be involved in their families and some might want to put their career on hold for a few years, the preferences differ.

I think ECSA can promote a flexible working environment. Promote the measurement and rewarding of output instead of ineffective hours worked. Perhaps an option can be considered to temporary put your professional registration on hold with reduced re-activation requirements should you need to temporary focus on your family (this can apply to all genders).



*Elekanyani
Ndlovu*

Can you provide a brief outline on your professional background?

I graduated with a Bachelor of Science in Electrical Engineering and Executive and Management Coaching qualification from the University of Cape Town (UCT). I am professionally registered (Pr. Eng.) with the Engineering Council of South Africa (ECSA) and I am also a member of the South African Institute of Electrical Engineers (SAIEE).

I have 15 years' experience in the energy sector. My experience includes Power and Petro-Chemical Engineering, working on large scale infrastructure projects, refurbishment projects and Greenfield renewable

energy projects. It also includes operations, project engineering, project management, project finance and business development, with a power generation background. My knowledge of the infrastructure landscape is enriched by my practical experience of working throughout the phases of a project life cycle, from inception through to commissioning, operations and maintenance. My leadership experience is enhanced by my various leadership roles and working with multicultural, multinational and multi discipline teams throughout my career.

My journey as an engineer has also led me to discover other passions, the love for teaching, storytelling and strategy. So, my portfolio of work includes being adjunct faculty at Henley Business School where I focus on self-mastery and leadership, innovation, design thinking and technology.

I also advise organisations and individuals in systems thinking and integrating complexity thinking into strategy and leadership. I host a podcast titled Womanifesto as well, Womanifesto centres voices, stories and experiences of women navigating through their professional and personal worlds. I am currently a director and business owner of Mikovhe Electrical and Training

Projects, which is an Electrical Infrastructure installation and maintenance business specialising in substations and transformers.

What motivated you to pursue a career in the engineering sector?

I believe that I am a product of collective action. The motivation to pursue engineering came from having female science teachers that made science feel not so removed from me as a female, it seemed like something females can be into. I loved being taught by those teachers and I chose the science route because I enjoyed their classes.

I have two older brothers who also influenced my decision, one was pursuing Electrical Engineering and the other thought engineering was the best choice for me in order to access better opportunities. It also helped that at the time there were a lot of bursaries to support engineering studies, so when I was awarded a Sasol bursary, there was no turning back.

I always say that my relationship with engineering is like an arranged marriage. It was not love at first sight but a practical solution to my need to study something. However, as I got to know and understand

what engineering is and what I can contribute through it, I grew to love it.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

I was awarded the Keith Plowden Young Achiever of the Year Award by the South African Institute of Electrical Engineers to recognise my leadership, achievement, creativity, innovation, entrepreneurship and enthusiasm.

I have held and continue to hold non-executive director roles in technical infrastructure and financial entities. My board roles include being Chairperson of the Board, Chairperson of Investment Committee, Chairperson of Social and Ethics Committee, member of Audit and Risk Committee and member of Human Resources & Remunerations Committee.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

I believe that the challenge in the early years as an engineer is being given meaningful work that gives you the exposure and the experience that you need to grow as an engineer and also be able to register professionally. So you have to learn to ask and negotiate for bigger meaningful projects. This means you have to work really hard to prove that you are ready for those projects and you must be prepared to confront the difficult conversation of explaining why you feel the work you are being given is not good enough. It is a challenging situation because sometimes you are unsure of your own explanation. It is finding the words and the courage that moves you forward and even then, you don't always get the project you wanted. This

delays your growth and your sense of contribution is impacted.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

The role of the regulator is to uphold the profession. Each profession has rules that have to be adhered to for the system and the industry to work and have a positive impact on communities. Each profession has a sense of belonging and pride about who they are and what they do. It is that sense of doing something meaningful and of being a part of something bigger than yourself that can keep people engaged in their different engineering spaces. The regulator should uphold that sense of meaning and pride. The regulator also has an opportunity to highlight and voice out inequalities and injustice in industry so that there is a push towards equal opportunities for everyone.



*Lebo
Maphumulo*

Can you provide a brief outline on your professional background?

I graduated in 2004 and immediately started working at Eskom. I started at the HV Plant Department where I was appointed as an Engineer in Training (EIT).

February 2005 I left Eskom and moved to Afrisam - Holcim Cement plant in Roodepoort where I was appointed as the Plant Engineer. In October 2005 I went back to Eskom and joined Central Grid where I was appointed as the

Technical Support Engineer in the Lines and Servitudes section.

In 2006 I moved on a level transfer to Line Engineering Services (LES) where I was promoted to a Senior Engineer in 2009 then Chief Engineer in 2014. In 2017 I was promoted to Corporate Specialist, Line Engineering Services (LES) and I am still based there.

What motivated you to pursue a career in the engineering sector?

When I matriculated in 1998, I actually wanted to study Accounting. I was persuaded to study engineering due to the high demand for black females appointed at the time. I was awarded a scholarship to study in Malaysia by the Department of Minerals and Energy.

I completed my BSc in electrical engineering at the University Technology Petronas (UTP) in Seri Iskandar, Malaysia. Years later, I completed my MSc in Electrical Engineering at WITS in 2018. My postgraduate studies were funded by a bursary from the

Eskom Power Plant Engineering Institute (EPPEI).

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

I have served on the ECSA Council for two terms since 2012. In my role as a council member I had the honour of being a Chairperson of two High Impact Committees namely the Policy Development and Standards Generation Committee, Stakeholder Relations Committee and I served as a member of the Central Registration Committee.

In 2014, I was appointed as Vice Chairperson of ECSA's National Electrical Professional Advisory Committee. In 2010, I started serving as a reviewer, assessor, moderator and mentor for ECSA. I have won the following awards:

- June 2010 – Engineer of the year Award: Generation Business Engineering Manager's Awards.
- August 2012 – Customer Satisfaction Award: Technology Engineering Manager's Awards.

- September 2012 – Customer Satisfaction Award: Chairman’s Awards.
- May 2017 – Best presenter in Session 2b of the EPPEI Workshop.
- September 2017 – Technology and Engineering Award for the Eskom Women Advancement Program (EWAP).
- October 2017 – Engineer of The Year at South African Institute of Electrical Engineers (SAIEE).
- July 2018 – Best Paper Award at Power Gen and DistribuTECH conference.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

- Most engineering industries are predominantly male-dominated.

- Visibility and access to female mentors that have overcome challenges faced in male-dominated industries.
- Discrimination due to preferences and biases in the workplace.
- Limited access to training due to the current prevailing financial conditions in majority of the engineering sectors and companies.
- ‘Pull her down’ syndrome, both from other races and your own race.
- High expectations when it comes to being given solid mentoring support plus assuming equal and fair distribution of opportunities.
- Availability and access to free mentorship and coaching programs.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

- Marketing and promoting engineering as a profession including career fairs.
- Ensuring that females are remunerated the same as their male counter parts.
- Offering free coaching webinars, where thriving female engineering professionals can share tips to motivate and inspire other females to stay in engineering.
- Free access to mentors in partnership with the VAs and educational institutions.



Morongwa
Mashwen

Can you provide a brief outline on your professional background?

I have 10 years' experience in the civil engineering industry. I started working in the private sector as a junior site engineer. I went on to work with water and sanitation projects in the public sector. I am currently working in the private sector focused on multi-disciplinary projects.

What motivated you to pursue a career in the engineering sector?

I wanted to make an impact in my society. My father worked in the construction industry for many years, and he made me fall in love

with the amazing work that they did. He made me believe that I could make it in this industry. Engineers were like magicians in my eyes, taking simple things like water, cement and stone and turning them into beautiful structures. The way they constructed roads in areas you would not think possible.

My grade 12 Geography teacher cemented that dream in me when he told us that there were very few women in this industry. I wanted to be a part of history making and of course, serving in the most amazing way I could ever think of.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

Serving our communities will always be the highlight for me. A wise person once said "we need to know the difference between cost and value". Our projects might not cost much to build but the value that we bring as engineers is priceless.

I am currently working on a project for construction of low-level bridges in the rural areas to provide the residents with access to amenities such as schools during rainy season. The cost of the projects is extremely low but the impact and value it has on those residents is massive.

Their excitement when they see us on site as they anticipate the project to get off the ground to make their lives easier and safer is beautiful to watch. It is much better than the awards and the accolades, and I know this because I have had the honour of having both.

I was awarded an academic excellence award by the Tshwane University of Technology.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

There are two main challenges that I have noted amongst many other challenges that we face. The first one is the lack of recognition/opportunities. Women are often not considered brilliant enough to handle big or challenging projects. You can come up with brilliant ideas, but they will not be taken seriously until they are presented by our male counterparts, who often present our ideas as theirs.

The sad part is that we often face the same challenge from other women as well. They are more than happy to report to a male senior and respect them, than report to a female senior, despite the contribution that both parties

make or the amount of knowledge one has. Many organisations say they are pro women but their way of doing things says otherwise. The second one goes hand in hand with the first one. Women are not given the respect they deserve.

This is a challenge in most industries, not just the civil engineering industry. When a woman speaks her mind or stands up for herself she is considered emotional, a diva, dramatic, and all kinds of names but when it is a man doing the same thing, he is considered strong, powerful and not to be messed with. It does not

matter how calm you are when trying to address certain issues, it will still be misinterpreted.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

Provide opportunities for women to be recognised for their amazing contribution in this industry. The regulator should host events for women, led by other women in the industry.

Have career fairs that are run by other women who are already

making waves in this amazing industry, for young girls so that the younger generation can see how amazing this industry is and that it is for everyone. Most young girls in the rural areas do not even have access to such information.

Work with organisations to help them take the necessary measures to involve women in the formulation of policies, especially organisations that want to forge a good relationship with the regulator.

The only people who know what kind of changes are required by women are women.



*Prudence
Madiba*

Can you provide a brief outline on your professional background?

I am an Electronic Engineer by profession, with a BSc in Electronic Engineering (UKZN), Post Graduate Diploma in Business Management (UKZN), Graduate Engineering Diploma in Industrial Engineering (WITS) and Masters in Engineering Management (UP). I am a Professionally Registered Engineer (2007) and a Fellow of the South African Institute of Electrical Engineers (2020).

I started my career with Eskom in 2002, as an Engineer in Training, and moved through the ranks to becoming a Senior Manager Engineering, Electrical and C&I Engineering Centre of Excellence, in 2012.

What motivated you to pursue a career in the engineering sector?

I have always liked to challenge myself and break into different

things out of the norm. As a young girl, expectations were that I follow careers modelled around those we saw in society, in science, it was mostly doctors. I wanted to be a pilot or air traffic controller. My parents were not convinced that it will be suitable environment for me as young lady. I then had to research, with limited resources, about careers that would best use my mathematics and science skills, but not in health. At the time, the government of Limpopo then, also partnered with University of Natal, who came to the province to explain the different courses they offered. That is how I found out about engineering and started my own interest in the field, and the rest is history.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

Recognition and awards:

- Group Five and University of Johannesburg – Women in Engineering and Built Environment Awards: 2014 winner of excellence at company level.
- South African Institute of Electrical Engineers – 2014 winner of the engineering excellence award.
- Eskom Women Advanced Program - woman of the year, 2017.
- Eskom Generation – runner up for executive of the year, 2017.

Current Boards of Entities / Professional Councils / Institutions:

- Member of the ECSA Council: 2020-2024 - I am a council member of the 6th Term

Engineering Council of South (ECSA) effective from November 2020.

- Member of the SAIEE Council: 2020-2022 - I am council member and on EXCO of the South African Institute of Electrical Engineering (SAIEE). I am the chairperson of the Technology, Knowledge and Leadership. I also serve on the Membership Committee.
- UJ FEBE Advisory Board: 2021-2023.
- Pfluxani STEM Foundation: 2016 to date - Founder of the Pfluxani STEM Foundation. This is a non-profit organization focusing on the improvement of teaching and learning in Science, Technology, Engineering and Mathematics (STEM) subjects in township schools in Gauteng.

Previous Boards of Entities / Professional Councils / Institutions:

- ARUP Education Trust: 2016 TO 2018 - I served as an independent Trustee of the ARUP Education Trust Board from 2016 to February 2018.
- Member of the ECSA Council: 2016-2019 - I was a council member of the 5th Term Engineering Council of South (ECSA) effective from September 2016. Also served on the ECSA Central Registration and the Audit and Risk Committees.
- Member of the SAIEE Council: 2014-16, 2016-18, 2018-20 - I was council member and on EXCO of the South African Institute of Electrical Engineering (SAIEE). I previously served as the Chairperson of the membership Committee, Chairman of the Events and Marketing Committee (2 years),

Chairperson of the Professional Development committee.

- WITS School of Electrical and Information Industrial Advisory Board (2018 - 2019).
- South African Bureau of Standards (SABS) – Recapitalisation Forum for NETFA (2015).

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

- **Work-life balance:** The flexibility of working hours and the pressure to perform. Covid-19 has shown us that we can have flexibility to work from home when necessary and still deliver within the set times. There is societal pressure and expectations of the role of women as they progress in life, how women are supported to perform in this sector and for them to still be able to fulfil other roles in the society. This is one of the reasons why women leave engineering or move into management not specialization.
- **Organization Culture:** How many people trust technical work done by women? How many times have we had women complaining that they need to work harder to prove themselves? She is always on maternity leave? Does the organizational culture allow for women to have a life outside of work? Can they have families? Is the focus on outcomes, or attendance?
- **The salary disparities** between males and females for the same work and positions in the sector

is still a huge concern. There is improvement in this, but the gap is still huge.

- **Barriers of entry** into main projects and technical organization ownership. How do we support women to access funds and deliver in high value technical projects? How do we support the female engineering managers?
- **Increase representation** of women in leadership positions, create attractive growth opportunities, both as technical managers and also as specialists.
- **Participation of women** in different forums in all governing structures in the industry to include female engineers in influencing the direction? How do we encourage women to participate without seeing this an overload to their already demanding jobs and mismatched work life balance?

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

One of the role of ECSA, as a regulator, is to advise the Minister of Public Works or CBE on matters relating to the engineering profession. This can be used to improve the following:

- **Participation of women** in different forums – how does the regulator ensure that it supports and drives the representation of women in technical forums? This is slowly improving but it must filter at all levels within the regulator structures and also government sectors

governing the technical and built environment in order to drive all other stakeholders.

- **Create an enabling environment** for female engineers to participate and remain in the profession. Currently, globally, only 60% of graduate engineers are retained in the profession, this speaks to the intake of female engineers and the retention of females in engineering careers.
- **The role of the regulator** starts from university intake, collaboration with universities and Department of Higher Education and Basic Education, in improving our girl children's view to engineering careers. How do we role model women in engineering as a first entry of showcasing the success of women in this environment? Are we monitoring the challenges of universities in making sure we increase the number of graduates?
- **Profiling of women** in engineering and targeted mentorship for women in engineering. The regulator has access to the Department of Public Works & Infrastructure (DPWI), members of the profession and the Voluntary Associations (VA's) to enable the environment and support to female engineers.
- **Driving of the transformation agenda** in the industry:
 - » How does the regulator influence policies to improve the working environment for retention of women? The salary disparities? The appointment of women in key technical organization?
 - » How do we influence continued professional development for women?



*Rachel
Ledwaba*

Can you provide a brief outline on your professional background?

I am an Engineering Practitioner registered in the Specified Category as a Lifting Machinery Inspector since 2010, working for Transnet Engineering.

I joined the organisation in May 2004 as an apprentice, trained as a Millwright and successfully completed my training and obtained Red Seal in 2007, then later completed a National Diploma in Electrical Engineering.

Most of my work experience as an Artisan was gained while working in

the maintenance department doing maintenance, repairs, fault finding, machine installation preventive & reliability maintenance on different types of machinery/equipment.

What motivated you to pursue a career in the engineering sector?

Choosing the right career in the engineering sector was a bit daunting for me. However, some of the factors that attributed and motivated me to persuade engineering studies was based on my drive to solve problems and finding lasting solutions to re-occurring problems.

After completing my matric I wanted to further my studies in a university institution, but due to lack of finances to do so, I then resorted to study at a then FET College now known as TVET Colleges, studying an Electrical Engineering course.

During my years of training as a Millwright there were certain modules in the curriculum that were specific to operations and maintenance of lifting equipment, I then started to develop interest in the different types of lifting machines, which led to me enquiring more about prerequisites to become a Lifting Machinery Inspector.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

Highlights as Reg. LMI: One of the many key highlights was being recognised as the First Young African woman to be registered as an LMI by the Engineering Council of South Africa (ECSA) in a field perceived to be mostly male-dominated. This on its own has opened doors to other opportunities for all aspiring young women who might have had doubts in their respective careers.

From 2014 I was appointed by ECSA as an assessor, moderator and reviewer for LMI registration, I was also part of the 2016 Recommendations Panel for new Council. In 2018 I was awarded the ECSA Volunteer of the year Specified Category award.

Serving on an ECSA Board / Working Committee: Recently I was appointed to serve on the Sixth Term ECSA Council and subsequently two High Impact Committees, namely Education Committee and the Training Academy and Development Committee and I also form part of the Identification of Engineering Work (IDoEW) Task Team.

However one of my key highlights in this area was the Committee members attention to detail pertaining to good governance and the agility in resolving challenges.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

In the industry where I am practicing, our male counterparts are given more developmental opportunities and also entrusted with leadership roles than their female counterparts. This on its own has a negative impact to each female's confidence and does make us to question our capabilities. However, I strongly condemn this type of injustice

and I am in support of a view that everyone despite their race or gender should be given equal opportunities.

Moreover, a female engineer's work is always subject to verification and scrutiny by the male counterpart. This creates the notion that a male engineer is more competent than a female engineer's which is not the case.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

ECSA as a regulator in partnerships with learning institutions and accredited organisations should embark on career exhibitions drives, promoting different engineering fields and their categories of

registration. Exhibitions are known to have a meaningful impact to create a much needed career awareness to young aspiring women from different walks of life and geographic areas who wish to become future engineers.

One of the other key measures the industry should exercise in order to retain existing female engineers is to fully give responsibility to their work without any undue interference, in turn this will bring about a sense of ownership and creativity.

Continuous development and better remuneration also play a major role in the retention of staff as it provides a sense of recognition and appreciation of the skillset rendered to the industry/organisations.



Rachel
Mangwenzi

Can you provide a brief outline on your professional background?

I graduated in 2003 and have been in the engineering industry for 18 years and most of my experience has been in the private sector but I am currently employed in the public service.

What motivated you to pursue a career in the engineering sector?

I grew up in a male dominated environment where most of my cousins were engineers and they always said I could do it, they are the ones who steered me to be in

the engineering field. One of the mottos from our family was “To live like a king work like a slave”, this always assisted me in being able to handle the hard work needed to qualify as an engineer.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

I believe in continuous development as such, in addition to my undergraduate degree, I have pursued an Honours and Masters Degree, and I have obtained a Certification in Project Management.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

As a female engineer, you have to prove that you can do it regardless of having a family. Balancing family and work is always a challenge for women in the engineering field, I am glad that my family gives me support whenever the burden tends to become heavy to balance. The most difficult challenge I experienced was when I had to

write my honours exam weeks after giving birth to my second daughter. Fortunately, I passed the exam, that is when I understood that as women we can take any challenge thrown at us. The other challenge is that most of the time you find yourself in meetings where you are the only female engineer and you have to prove that you can do it. This has not been an issue for me though as I come from a male dominated family.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

To ensure that there is equal recognition of both males and females in the engineering sector, female engineers should be identified as engineers first and female second. The regulator needs to ensure there is gender parity through policies that are geared towards acknowledging these differences and thereby addressing them.

The regulator also needs to ensure that it raises awareness of the importance of choosing STEM subjects to ensure a career in the Engineering and Built Environment sector.



*Tebogo
Mohapi*

Can you provide a brief outline on your professional background?

I obtained both my BEng in Electrical Engineering and MEng in Engineering Management from the University of Pretoria. I did my training between 2010 and 2011 at Eskom. I then started working as a Control Plant Design Engineer in 2012 and was promoted to Senior Engineer in 2013. I was also seconded to Project Manager and Revenue Measurement Manager between 2016 and 2021, while still practicing as a Senior Design Engineer.

What motivated you to pursue a career in the engineering sector?

I was young and honestly had very little guidance or knowledge in terms of choosing a career. However, what I was definitely sure of were my capabilities. I knew that I had an ability to influence and a desire to make a difference. From a young age, I recognised my tremendous ability to focus and

my above average analytical skills. When I read about engineering and the lack of black female engineers in our country, I immediately knew that I could serve in that field. I knew that my presence in the engineering field could potentially shape the gender composition of the field. I also believed that engineers work on solving important problems and that becoming one would allow me to help others and contribute to society. Because of my background, the potential of being able to assist my family financially also attracted me to pursue a career in this field.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

The ECSA award for being the Best Professional Registration Assessor for 2019 (for extreme professionalism, paying attention to detail and doing diligence to my work with continued commitment). Coming up with an effective strategy for challenges facing revenue measurement and it has been yielding positive results.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

Gender Discrimination - Engineering is still generally a male dominated field and females tend to be less trusted and are often undermined in their engineering capabilities. This often leads to women being given less opportunities especially on those projects, which are deemed large or risky. Unfortunately, this results in female engineers not receiving the necessary exposure

and experience, which eventually lead to less competence.

We enter a room full of men who mostly do not understand us and undermine us. We need to use more force just to be heard or our suggestions to even be considered. This constant battle is draining and demoralising, hence most women actually end up leaving engineering as they are tired of fighting for their positions. Most women are vulnerable by nature, but then when this comes out it is labelled as being weak. We are undermined by being asked to make tea, just to make us feel small and in some instances, it is simply because you are the only woman, you might be requested to arrange lunch for the team. In addition to this, there is sexual harassment in the workplace, having to balance work and life including being a mother and in some instances being regarded less competent because we need to take maternity leave and even family responsibility leave.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

The first point is the appreciation of the fundamental difference between a male and a female and their role in our society. When women are given the platform, they must also be given the support in line with their societal roles and their biological needs, and this needs to be normalised. Ignoring this fact breeds ongoing problems that will carry on from generation to generation and that is what we are currently doing. The problem is that we want to make man and woman equal, it is not necessary for them to be equal, equal opportunity is what we need from the industry.



*Tronél
Strydom*

Can you provide a brief outline on your professional background?

I obtained my National Diploma in Civil Engineering in 2001 from Technicon Pretoria (now known as Tshwane University of Technology) and started working as a Technician in January 2002. While working I studied part-time and obtained my B-Tech from Technicon Pretoria in 2003.

I registered as a Professional Technologist in 2010 and as an International Professional Technologist in 2021. I was fortunate enough to work on a wide variety of projects such as Bulk Water and Sewer lines,

National and Municipal Road networks, Private Developments and I also worked on one of the Soccer World Cup practice venues. The last 10 years I was focusing on Transportation Engineering.

Currently I am an Assistant Resident Engineer for SNA Civil & Structural Engineers on the R67 between Whittlesea and Komani. After 19 years of working behind a desk in an office I am loving working full time on site.

What motivated you to pursue a career in the engineering sector?

I was in Special Education due to my learning disability and Dyslexia. With this I learned to focus on my strong points. I loved Maths, Physics and especially technical drawings at school. This pointed me in the direction of engineering.

After attending a career day at the University of Pretoria my heart was set on Civil Engineering and I have not been in regret for one day.

What really drives me is the fact that we are the unsung heroes, giving communities roads, clean water and sewage. Civil Engineering is one of the biggest contributors when it comes to job

creation and improving peoples lives.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

I am currently the Chair for the Society of Asphalt Technology (SAT) Eastern Cape Branch, Vice Chair of the South African Institution of Civil Engineering (SAICE), Algo Branch and Regional Co-ordinator for the South African Road Federation (SARF). I am also an Assessor, Moderator and Interviewer for the Engineering Council of South Africa (ECSA).

One of my passions is Mentoring and Training. Everyone I help guide towards Professional registration gives me such a sense of pride.

I am also involved with the iGems (Incubating great engineering minds) program from Unity in Africa. This program is focused on introducing underprivileged kids to the world of Engineering.

I am considered an expert in the field of Traffic calming, SARTSM, Geometric Design & Road Drainage. I am currently working my way up the ladder to become a Resident Engineer (RE), I will be one of the handful of female Civil

Engineers that are recognised REs on SANRAL projects.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

One of the biggest challenges for me is that men treat us with kids gloves. I want to be seen as a Professional Engineering Technologist and not as a female Professional Engineering Technologist. We have become oversensitive with regards to gender. We are one profession and as a female, I see it as a great accomplishment to be seen as “One of the Boys”, as they would say.

The biggest gripe I have is the traditional gender roles that still need to be addressed. Roles like making the coffee and tea for a meeting or taking the minutes. But as females, we need to speak up

about this, as I have found that once you raise the issue, the men usually indicate that they were not aware of the fact that they are doing it.

Reshma Saujani TED talk “Teach girls bravery, not perfection” clearly shows the difference between males and females in the workplace. And being a mommy of 2 girls and 1 boy, I can confirm girls from a young age are trying to be perfect and boys are brave from day one. When females are brave enough to follow their passion, the change will follow naturally.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

Females only really entered this workforce in the 1970’s. We should also take note that only 18% of the Civil Engineering Industry is female in South Africa. However, this is

significantly more than the 10% in the UK and 14% in the USA.

Thus it is hard to say what ECSA can do to promote engineering under females, but one thing we need to communicate clearly is that this work is a passion and not just a job.

I know a large number of women leave because the responsibilities of being a mother and a dedicated Engineering Practitioner is hard. Especially as overtime is expected from certain companies and they do not necessarily compensate employees for overtime. Women working for such companies reach a glass ceiling if they have kids. If it is possible for ECSA to encourage companies to compensate employees for working overtime, the culture of expected overtime might change, and we will cultivate a better work-life balance work environment for all.



*Tshego
Cornelius*

Can you provide a brief outline on your professional background?

I am a BSc Electrical Engineering Graduate from the University of Cape Town and started working for Eskom in 2009, as an EIT (Engineer in Training) at the Western Grid Transmission Offices, in Belville.

I then relocated to Johannesburg, in 2010, to complete my training in the then Transmission Technology Department and the System Operation and Planning Department. Post the EIT period, I was appointed as a Protection Engineer. As part of the Generation Professionalising-Operations Programme in 2014, I was selected as one of the 20 Engineers across

the business to complete the power plant operation training and get exposure across the Eskom business, as well as international exposure, in Germany.

I later joined Eskom Generation and have since held various roles including Protection, Metering & Measurements and Control (PMMC) Design Manager, Project Engineering Manager and Contracts Manager.

As part of contributing to the fraternity, I am a registered engineer with the Engineering Council of South Africa (Pr.Eng, ECSA), a council member of the South African Institute of Electrical Engineering (SAIEE), Chairperson of the SAIEE Education and Training Committee, and a member of the Institute of Electrical and Electronics Engineers (IEEE).

I also volunteer with ECSA and assist candidates with professional registration, and I'm involved with policy development and reviews for ECSA as well as reviews of ECSA's strategic documents such as standards and guidelines.

What motivated you to pursue a career in the engineering sector?

I have always been a curious "technical" child and very hands-

on for as long as I can remember. I was that "let's break it and fix it" kid. My father is a motor mechanic and having been very close to him, "fixing and building things" became a hobby.

My mother was a Maths teacher and instilled the love for Maths in us. So Maths became my favourite subject, leading me to select and enjoy Maths and Science at High School and so, when I completed my matric, engineering became a relatable option for me.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

The broad exposure I have of the engineering fraternity, learning of new engineering technologies and having worked in various roles and divisions within Eskom are one of the highlights I can mention.

In terms of awards, as part of the Eskom Transmission Young Professionals team, we received an award for Sinobuntu (one of Eskom's values) for giving back to the disadvantaged communities. This has since encouraged me to continue promoting STEM and giving back.

I have also been awarded the Young Professional Special Award for the Eskom Women Advancement

Programme (EWAP); I was a finalist in the Energy & Environment Category Standard Bank Rising Star Awards 2018 and I was also a recipient of the 2018 South African Institute of Electrical Engineers (SAIEE) Keith Plowden Young Achievers Award.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

Our engineering industry is no doubt a male dominated industry and being a female on its own is a

challenge. Females tend to work twice as hard when compared to male counterparts, and some do not even receive recognition despite the extra work put in.

It saddens me when female engineers leave the industry to go pursue a career in a different field, due to frustrations and having felt stagnant. Female engineers need to stop seeking acceptance and approval in boardrooms and from male counterparts and actually appreciate their worth. Most importantly, let us support each other.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

The regulator can assist in creating more opportunities for women to be present in the boardrooms and be key decision makers. The salary gap issue needs to be addressed to promote fairness and lastly, female engineers could be retained by providing a conducive working environment to provide for equal and fair opportunities at the workplace.



Tshwari
Ramagofu

Can you provide a brief outline on your professional background?

I am a passionate, performance driven individual who continuously strives to develop her leadership skills and is constantly learning how to improve and develop others.

I'm currently employed by Eskom Transmission as a Middle Manager HV Plant, and my main role is to ensure that the HV Plant is operated and maintained in a safe and effective manner. As a manager, I constantly seek opportunities to operate and maintain the plant within a constrained budget and resources and ensure that safety and quality is maintained and outages are optimised and minimised, to sustain and continually improve the plant performance.

I started my career in Eskom Distribution as a Design Engineer, Senior Engineer and manager and was responsible for design of distribution substations, HV and MV line; and Electrification.

What motivated you to pursue a career in the engineering sector?

To be honest I never wanted to become an Engineer, it was just a second choice. I wanted to become a medical doctor as I believed it was the only profession in which I can make an impact in my community and in the process make good money. However, I was wrong, this was the best second choice that happened in my life and I am not looking back. I was then awarded a bursary by Eskom, which allowed me to study BSc Electrical Engineering at University of Cape Town.

What have been the key highlights in your career as an engineer? E.g. awards, serving on a board etc.

The confidence of striving for the best has always driven me from a young age. Since I joined Eskom, I have been in various committees and platforms such as Bursar Committees, Engineer in Training Evaluations, Chair and Member of Various Technical as well as Investment Forums and Women Advancement Programmes. I believe that you can never influence and guide the future if you are not involved.

I currently serve as ECSA council member for the second term since 2016 to date. For the first term council, I was the Chairperson of Investigating Committee and currently I am a member of Training & Academics Development and Research, Policy & Standards Committees. I also serve as council member for South African Institute of Electrical Engineers (SAIEE) as Chairperson of System Section.

In your observation, what are some of the key challenges that are encountered by female engineers in the industry?

- Often, women in male-dominated environments often lack self-confidence and suffer feelings of inferiority. In addition, if this is not managed actively through women advancement programmes it can deter many women from taking up positions in leadership roles.
- Lack of support and understanding from fellow colleagues is also challenging – and this calls out to all the females in this industry to genuinely support each other.
- There is gender discrimination that also leads to salary discrepancies.
- Conflicts of life balance especially when starting a family and also advancing one's career.

What is the role of the regulator in ensuring that the industry attracts and retains female engineers?

- The industry needs to recognize and admit the problem of gender inequality in the engineering environment and to enforce employers to develop and monitor workplace equity plans.
- Employers to receive incentives for good performance on their workplace equity plan.
- Create and enforce policies that protect women when they become victims of sexual harassment and discrimination.
- Regulate skills development and training that is targeted especially at women engineers.

The background features a stylized map of South Africa in shades of teal and blue, overlaid on a white background with faint, light grey gear and circuit patterns. The gears are of various sizes and are interconnected with lines and arrows, suggesting a technical or engineering theme.

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