

Civil Engineering

saice

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**COMMUNICATING
CLIMATE CHANGE:
A HOT TOPIC?**

**INTRODUCING SAICE'S
NEW FIRE ENGINEERING
DIVISION**

**SAICE 2001 PRESIDENT
RECEIVES NSTF
LIFETIME AWARD**





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Going forward

This recent period has been a challenging time for SAICE, and while the Executive Board has already publicly commented on and acknowledged several matters regarding the July magazine article "Out on a rib" by our CEO, it's befitting to share some thinking and direction.

"When you have a conflict, that means that there are truths that have to be addressed on each side of the conflict. And when you have a conflict, then it's an educational process to try to resolve the conflict. And to resolve that, you have to get people on both sides of the conflict involved so that they can dialogue." This is attributed to Dolores Huerta, a Mexican-American labour leader and civil rights activist, and her words are very relevant for where we now find ourselves.

Despite the upheaval of the recent times, it's gratifying that SAICE has had numerous constructive and positive offers for robust debate and assistance from various individuals, academia, consulting firms, women's groups, and SAICE units including branches, divisions, committees, panels and student chapters.

Our actions in the past have spoken for themselves, and the changes in our membership demographics, in particular the representation of women in SAICE and SAICE structures, speak volumes with respect to the transformation of SAICE. Over the last two decades women engineers have served most ably (and increasingly continue to do so) in our Institution's governing bodies, and play active roles in our technical divisions and at branch level. However, SAICE recognises that many inequalities

are still prevalent, both within our profession and society at large, and there is a very real need to intensify initiatives to enhance inclusivity and address diversity issues within the engineering sector.

SAICE supports the view that diverse organisations are more innovative and profitable, and better reflect the communities in which

they operate. Leadership in organisations is increasingly aware that inclusive workplaces are more efficient and effective through making the most of the talents and abilities of all employees. But we also believe we need to engage in objective discourse regarding long-entrenched gender inequalities, and I would like to use this opportunity to invite continued candid and constructive discussion on the matter. I look forward to the involvement and engagement of all our members on this continuing journey.

The Executive Board expresses the resolute intention to reflect on this episode and to use it as an opportunity to take the engineering profession forward. We absolutely need to work together to address numerous challenges, including educational inequality, guidance and training of graduates, better communication skills and apathy or lack of involvement.

The time has come for all of us to embody the skills inherent in all engineers – collectively we need to assess, analyse, collect information, think, check, plan and execute an appropriate initiative which will make a true difference to inclusivity and equality. While we have emphasised career guidance to encourage women to enter the field, we must continue to focus on the natural beginning point of communicating the correct information at school level to all learners who show an aptitude for and interest in STEM careers to ensure that we are attracting learners from South Africa's vast pipeline of talent and guiding them into the engineering sector rather than losing them. We can no longer afford to continue excluding valuable human resources.

In closing, I hope we can all take inspiration from another highly relevant quote, this time from Alain Dehaze, an American activist who said: *"Diversity requires commitment. Achieving the superior performance diversity can produce needs further action – most notably, a commitment to develop a culture of inclusion. People do not just need to be different, they need to be fully involved and feel their voices are heard."* We have the commitment to change the face of our profession and this can best be advanced by involvement, interest and collaboration. ■

Errol Kerst Pr Eng

SAICE President
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The time has come for all of us to embody the skills inherent in all engineers – collectively we need to assess, analyse, collect information, think, check, plan and execute an appropriate initiative which will make a true difference to inclusivity and equality.



ON THE COVER

P4

ON THE COVER

The durability specifications for concrete are changing the way that the civil engineering sector views the application of concrete in projects. AfriSam's ISO 9000 listing, its standardised operating systems which are aligned country-wide, and its SANAS-accredited laboratory all contribute towards meeting the rising standards demanded in civil engineering.

► AfriSam's Centre of Product Excellence laboratories conduct durability index testing, a service available to the construction industry on a commercial basis



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Raising the durability bar for concrete in civils

DURABILITY INDEX APPROACH

The use of the durability index performance-based approach is today well established in infrastructure projects conducted by the South African National Roads Agency Limited (SANRAL), and the specification of ‘durability concrete’ with applicable tests will further raise the bar for contractors and suppliers.

“The durability specifications for concrete are changing the environment and shifting the way that the civil engineering sector views the application of concrete in projects,” says Mike McDonald, manager of AfriSam’s Centre of Product Excellence. “The contractor is now more concerned than ever about the materials that are used in manufacturing concrete, and also how the concrete work is maintained and cured after being put in place.”

McDonald emphasises that among the most important elements affecting the lifespan of a civils structure are the quality and specific properties of the concrete used. This durability is vital in ensuring that public funds are well invested in structures that will stand the test of time and continue to service the community during its designed service life, and even beyond.

The durability index tests designed and applied to concrete in civil infrastructure are based on key parameters that allow the structure’s design life to be predicted and prolonged

“The durability index (DI) tests that are being designed and applied to concrete in civil infrastructure is based on key parameters that allow the structure’s design life to be predicted and prolonged,” he says.

“The specifications help to further improve standards, and affect not just contractors, but also suppliers who must ensure even tighter adherence to limits when it comes to road material such as aggregates for base, sub-base and asphalt, for instance.”

According to Ray Bonser, product technical manager at AfriSam, the trend towards tighter specifications and closer monitoring certainly places pressure on contractors to partner with trusted suppliers.

“There is growing reliance on the supplier of construction materials to be well equipped with the relevant expertise, systems and operational capacity to deliver material to increasingly tighter tolerances, and to do this consistently and reliably,” says Bonser. “The process also creates financial pressures, as tighter specifications are invariably costlier to meet.”

He notes that the depressed climate in the civil engineering sector today means that contractors are often not in a good

position to readily absorb any extra costs. The meeting of specifications therefore must be achieved as economically as possible.

EFFECTIVE RESOURCE UTILISATION

One of the issues this raises is effective resource utilisation, according to McDonald. While some operators respond to the need for greater durability by simply raising the quantity of cement used in concrete, this has implications in terms of cost and – perhaps more importantly – sustainability.

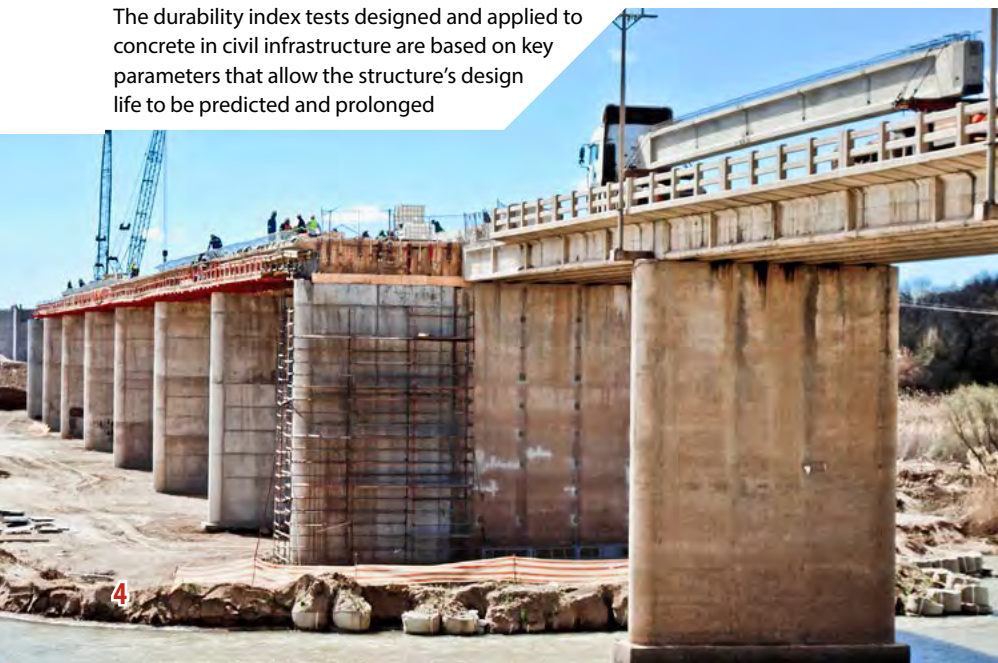
“Both the civil engineering and construction materials sectors are concerned about climate change, and are incorporating sustainability in their strategic decision-making,” he says. “Just using more cement to address the requirement for durability is not a solution, as this will invariably raise the carbon footprint of the project as a whole.”

The challenge for contractors and suppliers is to meet the durability specifications, while continuing to optimise concrete volumes and properties to limit the carbon footprint.

“Achieving higher levels of sustainability includes the ability to make high-strength concrete that facilitates the construction of smaller columns and thinner decks, for example. But these structures must also fulfil the life expectancy of the structure, or even exceed it,” he explains.

He adds that a longer-lasting solution also promotes sustainability, as it delays the construction of a replacement structure – and all its concomitant carbon impacts – for a longer period.

According to Bonser, a strategy that can contribute significantly to achieving the goal of better resource utilisation is for consultants to start working closely with contractors and suppliers at the earliest possible stage of a contract.



“This ensures better use of the raw materials at their disposal. Where a specification is written without reference to the practical availability of certain materials, then this ‘disconnect’ can lead to a specification being prepared that no supplier can meet.”

He emphasises that most construction materials – from cement to aggregate and concrete – are highly sensitive to the distances over which they can be affordably and operationally transported. Long distances can make it unaffordable to supply certain kinds or specifications of product to a site. This challenge is especially relevant where certain materials like fly ash or dolomitic aggregate are located only in geographically specific areas.

“Given the relatively restricted zones of affordability, it makes sense to have close collaboration along the whole chain of project participants – the client, the consultant, the contractor and the suppliers.”

Companies like AfriSam make it easier for customers in this regard, due to their wide footprint of over 40 facilities countrywide. This also allows its aggregate (produced in accordance with SANS 1083 standards) to be supplied from different mineralogical deposits.

“As well as supplying to specification, we also have the capacity to produce volumes and to provide back-up supply should there be the need to augment production from another source,” Bonser says.

MAINTAINING PRODUCT EXCELLENCE

Working with partners who have deep expertise across the range of materials and manufacturing processes that affect concrete durability is also now becoming more important, as this reduces the risk of non-compliance to specifications.

“Having all the facets of construction materials under one roof gives companies like AfriSam the ability to advise customers, as well as to draw on our scientific foundation in aggregate and cement, and the manufacturing and delivery of concrete,” says McDonald.

According to Amit Dawneerangen, AfriSam’s general manager readymix, it is the inter-relationship between the company’s business units that allows close control and management of the different ingredients.

“Having direct control over the full value chain of inputs and technology in concrete helps to enhance product



Suppliers of construction materials should be equipped with the relevant expertise, systems and operational capacity to deliver material to increasingly tighter tolerances, consistently and reliably

performance,” says Dawneerangen. “In our operational environment, where standards are constantly evolving to improve durability and sustainability, the capacity to develop, supply and test customised mix designs is vital.”

He highlights that AfriSam has conducted extensive research into concrete durability and is a leader in concrete durability testing. This has given the company a detailed understanding of how constituent materials and site practices impact on durability and performance.

“Our Centre of Product Excellence laboratories are set up to conduct durability index testing, a service available to the construction industry on a commercial basis.”

AfriSam’s national product technical manager readymix, Nithia Pillay, highlights some of the complexities when it comes to considering durability in concrete.

“There is the misleading belief that higher strength means better durability. It was also previously believed that Portland Cement mixes were better in terms of durability when compared to mixes which incorporated extenders. Rather, it has been shown that blends of Portland Cement with PFA or GGBFS produce superior concrete durability properties; also, adequate curing is vital in deriving the benefits of the extenders.”

He emphasises that the most important factors to consider when specifying durability include the anticipated service life of the structure, its usage, its environment, the construction method, and the materials being used by the concrete supplier.

“Much research is under way into ingress mechanisms and methods of

containing the degree of ingress for the various sources of concrete degradation,” he says.

“AfriSam’s ISO 9000 listing, standardised operating systems aligned country-wide, and SANAS-accredited laboratory all contribute to meeting the rising standards demanded in civil engineering,” says McDonald.

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AfriSam’s national footprint allows its aggregates, produced in accordance with SANS 1083 standards, to be supplied from different mineralogical deposits

How sustainable urban design can reduce infrastructure costs



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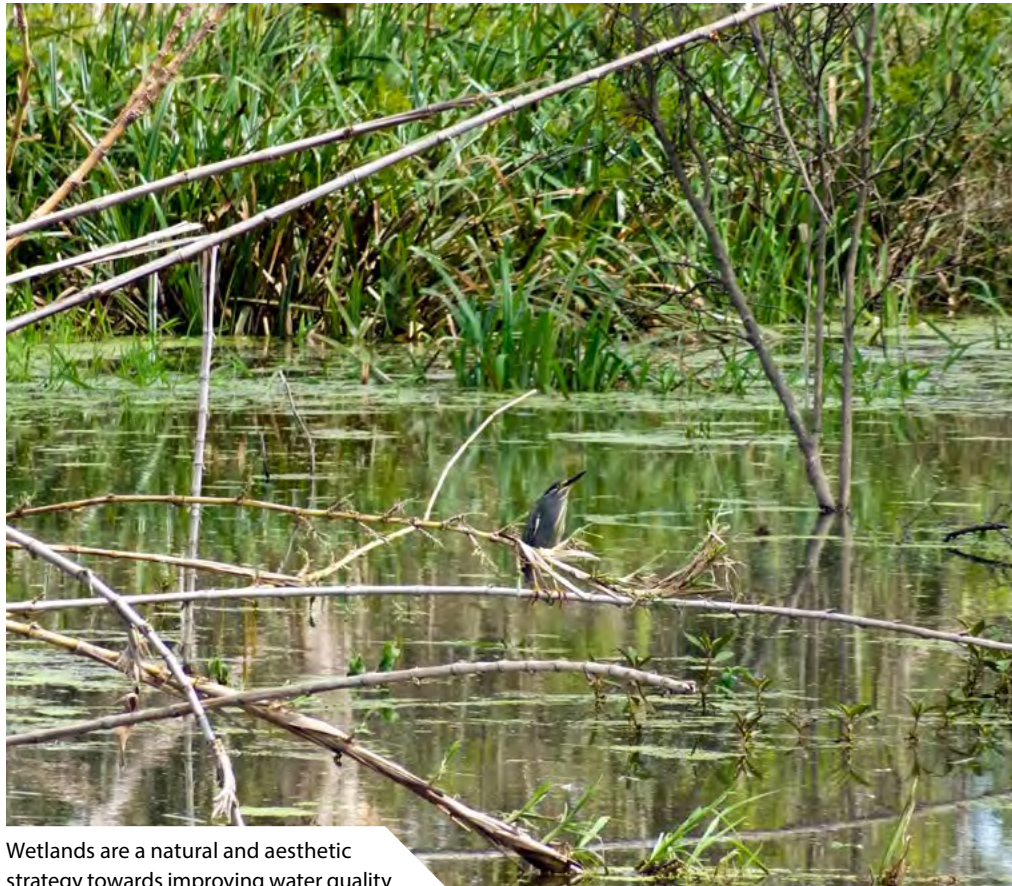
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Developers often associate environmental requirements with additional costs and extended project time frames, in many instances seeing environmental services as a grudge purchase. But what if the opposite was possible? What if building environmental considerations into each phase of infrastructure development could decrease the overall cost of the project?

In this article, we describe how this can be accomplished. We look at the various phases of infrastructure development and explore how the use of environmental considerations and innovations can avoid delays and potentially even reduce the cost of infrastructure development. Indeed, while this article focuses on infrastructure development, the approach proposed may be adapted to any type of development.

PHASE 1: SITE IDENTIFICATION

Generally, infrastructure development projects are undertaken in response to the need for services in an area. In some instances, site conditions are ideal for development, especially in more rural settings where developers have the luxury of sufficient space to suit their needs. However, suitable land for development in close proximity to city centres and built-up urban areas is usually limited. Various environmental factors impact on land suitability and



Wetlands are a natural and aesthetic strategy towards improving water quality

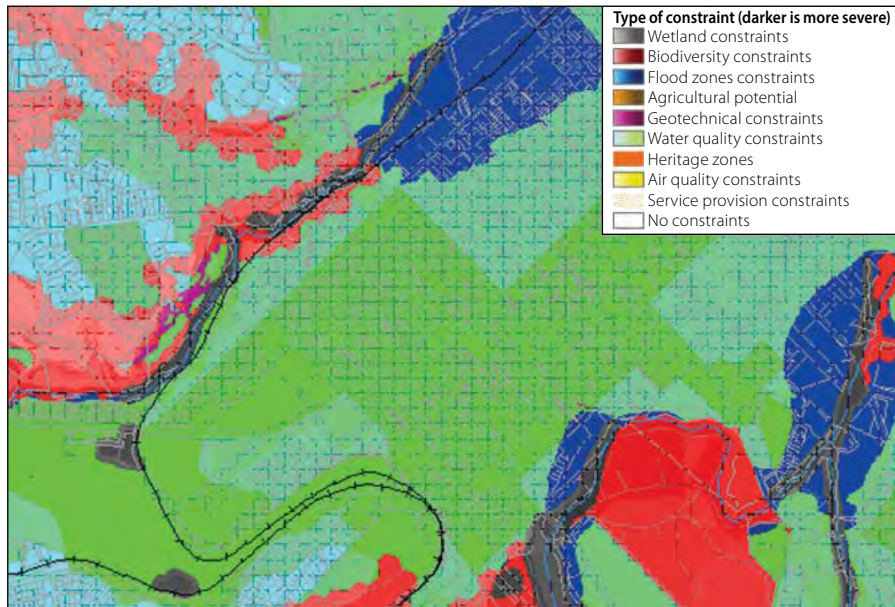
constructability, which could range from geotechnical stability to areas set aside for conservation purposes.

It is therefore important to understand an area earmarked for development or infrastructure establishment, in the context of the environmental challenges and opportunities that exist in the area. By going through a process of elimination, suitable sites can be identified and assessed further. This can be achieved by spatially mapping the environmental opportunities and constraints of an area earmarked for development. Environmental opportunities can range from suitable soils to areas with a low environmental conservation significance. Environmental constraints, on the other hand, can include environmentally protected or regulated areas such as watercourses,

municipal conservation areas, steep slopes and unsuitable soils – which are generally difficult to develop. The mapping which provides a spatial snapshot of potentially developable areas and no-go areas is called negative mapping.

This negative mapping exercise is commonly undertaken during the site selection process, but relies on the amount and quality of the mapping data available. A useful resource for these purposes is a comprehensive and up-to-date geospatial database of environmental constraints, which makes it possible to easily map less suitable areas and use them to plan proposed infrastructure layouts or linear alignments.

To build on existing information, the use of GIS, mobile-mapping and data visualisation facilitates the collection



An example of a screening map used to inform site and route selection, based on suitability from an environmental perspective

of spatial data. It allows the live upload of information gathered in the field for real-time access by the entire project team. This significantly reduces the time between the collection of the data and its use in informing project planning – also reducing the costs of data collection.

Without such hi-tech tools, it may only be discovered during the detailed design stage that an area is totally unsuitable for development due to environmental constraints. Changing designs at that point is likely to result in substantial additional costs and delays.

PHASE 2: PLANNING

Another valuable intervention is a review of legislated environmental requirements at the outset of a project, as this can often identify alternatives in the design that will avoid the need for environmental authorisation, permits or licences. South Africa's environmental legislation is largely dictated by thresholds and proximity to sensitive environmental features. Being aware of these sensitive features allows a project to find ways to avoid them and thus also avoid triggering the need for an Environmental Impact Assessment (EIA). A good starting point is to understand these thresholds so that they can be considered in the design. A screening of enviro-legal requirements by a qualified and experienced environmental scientist or practitioner is therefore crucial during the planning phase.

Obtaining environmental authorisation by undertaking an EIA can take

anything from six to twelve months, with another four months for a final decision to be reached by the authorities. Careful planning can inform project designs and thresholds to the extent that an EIA process may not be required, which could lead to significant time and cost savings.

Even if an EIA is unavoidable, the screening of impacts allows developers to understand the environmental implications before committing substantially to a project. Screening allows many risk factors – such as fatal flaws, costly mitigation measures and no-go areas – to be identified during the concept or prefeasibility stage. The cost of required management measures can then be included in feasibility assessments. It also allows the EIA process to run in parallel with project planning so that it does not delay the project.

PHASE 3: DESIGN

In South Africa's National Development Plan 2030 (NDP), Sustainable Development Goals are used to inform national development policy and projects up to 2030. By implementing policies aimed at increasing sustainability, the development goals aim to eliminate poverty and reduce inequality (NDP 2030, p 1), thereby bringing about real change in the lives of all people living in South Africa.

The NDP also aligns with the United Nations Sustainable Development Goals and the global effort to make infrastructure, water and sanitation, urbanisation and cities more sustainable.

In keeping with these Sustainable Development Goals, the South African Water Research Commission (WRC) has produced the *South African Guidelines for Sustainable Drainage Systems* (SuDS). SuDS use ecosystem goods and services to replace traditional engineering at reduced cost. The guidelines set out the methods which can be used to create sustainable stormwater drainage design that is both functional and healthier for the environment. These approaches have practical limitations, such as requiring additional space. In some instances they may also have a higher initial cost, but in general cost less in the long term if measured by a life-cycle cost analysis; such an analysis would incorporate the cost or value added of the natural goods and services provided, as well as the long-term maintenance costs.

By leveraging the use of natural goods and services, the SuDS approach works to reduce costs, improve efficiencies and provide a more sustainable and holistic solution. Under the right conditions, it uses the natural abilities of plants and organisms within the soils and aquatic systems to dissipate energy, reduce erosion and clean water downstream – so that the costs to carry out these services are reduced or even removed completely.

A typical example of using SuDS to inform stormwater design is the creation of a constructed (engineered) wetland – an alternative approach to dealing with pre-development and post-development attenuation of storm flows, as well as a natural, aesthetic solution to water quality improvement. A constructed wetland can be incorporated into typical stormwater management plans as an attenuation facility to accommodate the obligatory 50-year design storm volumes.

Providing SuDS-based solutions typically requires an interdisciplinary approach, which facilitates the additional potential benefit of innovation on the boundary of disciplines, drawing on professionals such as civil engineers, environmental scientists, engineering geologists and geohydrologists – depending on the complexity of the project. An integrated approach that closely aligns the contribution of each specialist will typically yield an outcome that adds more value than just the sum of its parts. Such designs will tend to be the most reliable, cost-effective and sustainable.



Flora and fauna of rehabilitated grassland, offering a number of traditional infrastructure services such as stormwater attenuation and erosion control

PHASE 4: IMPLEMENTATION

Construction managers frequently experience cost overruns and delays as a result of misalignment between the design specification and actual construction. Similarly, non-compliance with environmental requirements – which results in delays and costly rehabilitation – results largely from contractors being unaware of these requirements or misunderstanding them. This is a real

risk, given that environmental requirements are governed by multiple pieces of legislation, and requirements are specified by more than one authority. The requirements are therefore not always aligned, and in some instances seem to be contradictory.

For instance, a pipeline project may require environmental authorisation – in terms of the EIA Regulations GN R326 (2017) promulgated under the National Environmental Management Act (NEMA) of 1998 – and a water use licence in terms of the National Water Act of 1998. The former would have been granted by the Department of Environmental Affairs or their provincial equivalent, and the latter by the Department of Water and Sanitation. Either of these two sets of requirements may refer to further requirements, as detailed in a separate specialist report. It is easy to see how misunderstandings can arise.

To address this risk and improve compliance, an Environmental Implementation Plan (EIP) can be used as a site-specific implementation plan for

project managers and contractors. The EIP – which differs from an environmental authorisation or Environmental Management Plan – breaks up the requirements into specific areas (particularly relevant for linear infrastructure) or specific activities. In this way, the EIP takes various requirements and integrates these with the project schedule.

The EIP allows a focus on just one part of a development, by presenting all the environmental requirements for just that part. During this process, inconsistencies and conflicts can be resolved through consultation with the various authorities and specialists. This would be done prior to construction, in order to avoid delays. The EIPs also aim to represent as much information as possible in maps, such as sensitive areas, which also makes it easier for a contractor to understand what is required. Design specifications can be integrated into the EIPs to further reduce the need to review multiple documents. A contractor can then review the requirements for a particular day at a glance, instead of needing to refer back to a number of lengthy documents.

As per the example above, it is possible for developers to consolidate the most applicable and important requirements of the environmental authorisation, the water use licence, any additional specialist requirements and the design specification for a specific section or activity in a larger project. Construction managers would then clearly understand their obligations for the following day's work, because they would be able to focus only on the requirements for that specific part of the project and not the entire project.

At a practical level, the EIP would outline on a map that the work for the following day includes the excavation of a wetland area – and would highlight specifically where the wetland boundaries and buffers occur, as well as the special measures required while excavating a wetland. These measures may include that the wetland must be dug by hand and the excavated soil must be stockpiled separately. It would also include the design drawings for the installation of a pipeline trench through the wetland – which would be different from the rest of the pipeline. The map would even identify a suitable



Natural water purification provided by wetlands



A manufactured wetland as part of a housing development, assisting the sewage treatment plant with water purification and providing stormwater attenuation from the houses and other hard surfaces

location for the stockpiling of the soil. A construction manager would then know that additional equipment for hand excavation is required – and even the design specification that 300 mm of concrete, for instance, would be required to encase the pipeline for 30 m.

It is our experience that when the requirements are laid out simply, are represented spatially and are better understood, compliance increases dramatically, rehabilitation costs reduce substantially and delays are minimised considerably.

CONCLUSION

The natural environment is an impressive self-cleaning and regulating system. By integrating the natural environment in all phases of infrastructure development, the natural environment can provide a basis for urban design strategies that can reduce infrastructure costs and project delays when systematically implemented.

Gertrude Stein (American writer/poet 1874–1946) once said the following: “Everybody gets so much information all day long that they lose their common sense.” The approaches proposed in this

article are just that – common sense. While there are a number of challenges in any infrastructure development project, by timeously incorporating environmental considerations at every stage of an infrastructure project, and by communicating the requirements in a clear and simple way, project performance can be improved and money can be saved.

This approach highlights the rules and provides a map of the playing field before requiring action from the players – offering a way to cut through the noise and to let common sense be heard. □



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Construction of 2 Mℓ balancing reservoir

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Sundwana Water Supply Scheme – from stand-alone to regional

During its 2003 feasibility study, the Amathole District Municipality (ADM), the client, identified the Sundwana area in the Willowvale magisterial district as the last to be supplied with access to water in the region.

The original Sundwana Water Supply Scheme (SWSS) would supply potable water directly to 26 villages in the Sundwana area, with a total population of 6 388 (1 315 households). Although the feasibility study concluded that the Sundwana project should be implemented as a stand-alone scheme with its own surface water source, it also recommended that the ADM should investigate options that would increase the supply area, thereby improving the viability of the project.

The Sundwana area is situated on the west bank of the Mbashe River near Collywobbles, and is approximately 28 km from Dutywa towards the coast. The Nqabara River flows from Dutywa in a south-easterly direction to the sea, and the location of the dam site is about 15 km from Dutywa along the Nqabara River.

PROJECT BACKGROUND

During the period 2007–2011, the ADM's Planning, and Operations and Maintenance divisions experienced significant problems with the provision of water services in the greater Dutywa and Willowvale areas. As the final remaining project to be implemented in this area, the ADM decided that, in accordance with the recommendations from the feasibility study, the supply area for the SWSS project had to be increased. This resulted in the supply area of the dam being increased to serve

a total of 194 villages with a population of 126 242. The scope of the SWSS was therefore increased to supply a further 168 villages, including seven regional water schemes. Preliminary dam site investigations undertaken by HHO Consulting Engineers in 2007 resulted in the Sundwana Dam being relocated to the Nqabara River, with an increased gross capacity of 3.5 million m³.

The SWSS project is being implemented in seven phases to facilitate early water supply to the Sundwana area. The phases can be outlined as follows:

PHASES 1A TO 1F – SUNDWANA WSS

These phases entail the supply of water to the Sundwana area by using temporary supplies from the Dutywa East Scheme. The scope of work envisaged under Phases 1A to 1F are as follows:

- Construction of a 2 × 2 Mℓ master balancing reservoir
- 21 km of bulk gravity mains

Completion of reinforcement to the 2 Mℓ balancing reservoir





Completed 2 x 2 Mℓ balancing reservoir

- 143 km of village reticulation
- Nine 20 kℓ village storage reservoirs
- 267 standpipes.

PHASE 1G – REGIONAL BULK WATER SUPPLY TO EIGHT OTHER SCHEMES

To facilitate the provision of bulk water supply to 126 242 people, it was proposed to build a dam of 3.5 million m³ along the Nqabara River. Raw water will gravitate to the new water treatment works, from where it will be pumped in two directions to the master balancing reservoirs, and from these master reservoirs the water will gravitate further to the additional schemes. The scope of work envisaged under Phase 1G is as follows:

- Construction of a 3.5 million m³ earth dam
- Construction of a 583 kℓ/hr water treatment works
- Construction of two pumps stations
- Construction of a 2 Mℓ clear-water reservoir
- 500 m raw water main from the dam to the WTW
- 20.2 km rising main from the WTW to the master reservoirs
- Construction of a 6 km concrete access road.

FUNDING

The SWSS project is being funded from two sources, namely the Municipal Infrastructure Grant (MIG) and the Regional Bulk Infrastructure Grant (RBIG). As the project has increased

substantially in cost and scope, both funding mechanisms have to be utilised – MIG funds can only be used for infrastructure aimed at basic levels of service, whereas the RBIG is suitable for funding larger infrastructure such as dams, large diameter pipelines, and so forth.

PROJECT PROGRESSION

Phases 1A, 1C, 1E, 1F and Phase 3 have already been built, while Phases 1B, 1D and 1G still have to go out to construction. Phases 1B and 1D are almost ready to go out, while Phase 1G requires funding commitment and the finalisation of the detail design. Table 1 summarises the phases.

SWSS CHALLENGES

One of the challenges being encountered during the project is the scarcity of good dam building materials, which limits the construction sequence, and results in delays.

A further challenge is the fact that environmental permits are linked to time frames. Continued construction delays result in these permits expiring, requiring the environmental process to be repeated, which is time-consuming and costly.

ENVIRONMENTAL CONSIDERATIONS

Throughout the project every effort has been made to ensure that the implementation of this project has a minimal negative impact

Table 1 Project Phases

| Phase | Description | Contractor grading |
|--------------------------------|---|--------------------|
| Sundwana Water Supply Phase 1A | Construction of a water reticulation network in the Sundwana area which includes 48 km of village reticulation pipelines | 7CE or higher |
| Sundwana Water Supply Phase 1C | Construction of a water reticulation network in the Sundwana area which includes 25.9 km of village reticulation pipelines | 6CE or higher. |
| Sundwana Water Supply Phase 1E | Construction of a water distribution network in the Sundwana area which includes the construction of approximately 21.45 km of bulk water pipelines | 7CE or higher |
| Sundwana Water Supply Phase 1F | Construction of 11 reinforced concrete reservoirs in the Sundwana area | 7CE or higher |
| Sundwana Water Supply Phase 1B | Construction of a water reticulation network in the Sundwana area which includes 31.1 km of village reticulation pipelines (EPWP guidelines) | 7CE or higher |
| Sundwana Water Supply Phase 1D | Construction of a water reticulation network in the Sundwana area which includes 38 km of village reticulation pipelines (EPWP guidelines) | 7CE or higher |



Implementing EPWP principles, work has been given to people of the Sundwana villages during five phases of the project so far

on the environment. Collywobbles is an ancestral vulture colony breeding along the eastern cliffs of the Mbashe River, where the average height of the cliffs is 300 m.

This Cape Vulture breeding colony is estimated to have approximately 200 breeding pairs – the largest and most important Cape Vulture breeding colony in the southern breeding node, with Collywobbles being the largest breeding colony in the Eastern Cape. The Cape Vulture breeding season commences in late April and continues to December.

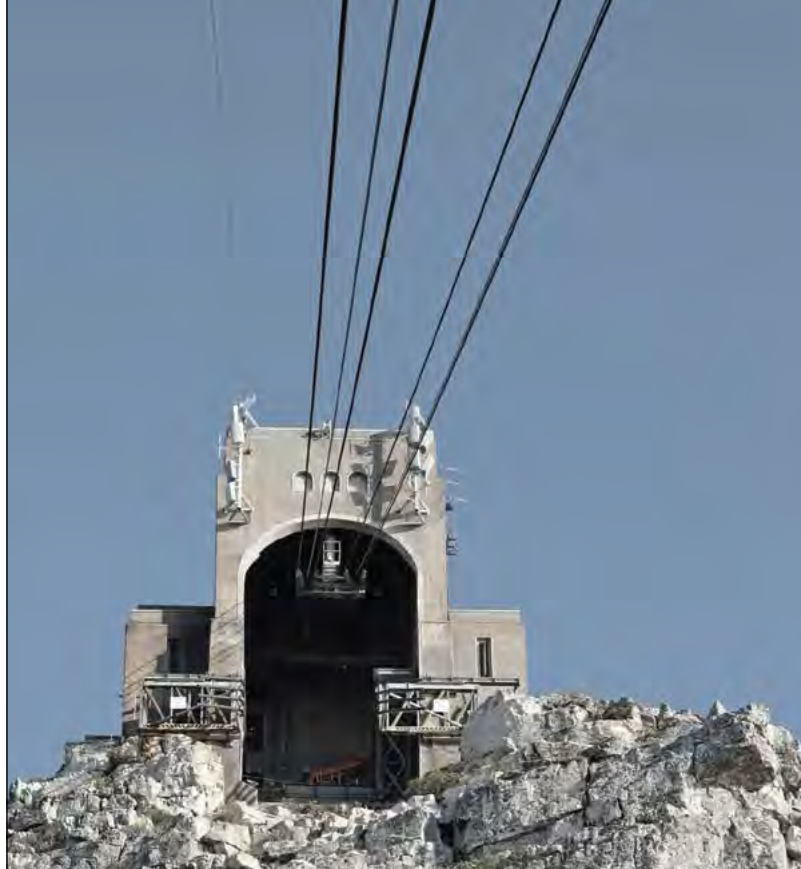
As it was feared that the intrusion and construction activity in the area would unsettle the vulture colony and possibly influence their breeding patterns, HHO project leader Brentt Mossick proposed that the implementation of the project be undertaken in phases.

The vulture colony area was therefore demarcated as a sensitive area for restricted construction activities. The phased implementation would also meet the client's need to progressively serve certain areas with access to water. The use of Expanded Public Works Programme (EPWP) methods would furthermore allow smaller projects to be implemented in phases around the sensitive area outside of the breeding season. In so doing the implementation of the project was scheduled around the breeding season in such a manner that the 'delayed implementation' would have no impact on the service delivery targets of the client.

HHO revised the construction specifications to include full EPWP guidelines to enable only labour-intensive construction within a 5 km radius of the vulture colony, restricted to the months of January to April, with no heavy plant to be utilised on site, and rock blasting limited to four-hour windows per day, once a week.

PROJECT MILESTONES

The project's success so far has been the client's commitment to building the smaller infrastructure first, whilst waiting for the bigger infrastructure to be implemented. In this manner work has been given to the people of the Sundwana villages during five phases of the project. As soon as the temporary water source is reached, they will also be able to receive much-needed water. □



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The landscaped eighth-floor 'Central Park' which will run the entire length of the Harbour Arch precinct to be constructed in Cape Town (artist's rendering)

Bringing nature into **building design**



Nicholas Stopforth
Managing Director
Amdec Property Developments
nicole@irvinepartners.co.za

A GROWING GLOBAL TREND

The question nagging at the world's global conscience is: How can we better protect our planet? With a growing world

The eco-friendly Harbour Arch precinct will be constructed on the Cape Town foreshore over the next five to seven years (artist's rendering)

population this question is particularly relevant to where we live and work.

Although property development and nature might not automatically go hand in hand, more and more developers are moving towards incorporating nature into building design.

This is also evident in this year's nominees for the tenth World Architecture Festival awards event

(Berlin, mid-November) that will be celebrating innovation in design across 68 countries. Buildings on the shortlist, across more than 30 categories, feature creative ideas for natural ventilation and light, as well as water-saving and energy-efficient solutions.

An associated global trend on the rise in major city centres is rooftop gardens. Hubs like Hong Kong, Tokyo, Rotterdam and New York are becoming known for urban farming initiatives, not only to beautify the environment, but also to boost food resources.

This movement coincides with a dramatic growth in mixed-use developments featuring apartments, hotels, shops, gyms and restaurants, as developers aim at innovatively creating green spaces, using international best practice to design an urban environment that is redefining city living.

CLOSER TO HOME

Johannesburg has long been considered the world's largest man-made urban forest, boasting over 10 million trees.

But Cape Town could be playing catch-up. Its city skyline is set to change as it sees its first environmentally-friendly mixed-use development come to fruition





Street view of a user-friendly Harbour Arch precinct (artist's rendering)

over the next few years – Harbour Arch. Harbour Arch will be built on the foreshore by the Amdec Group, who also developed Johannesburg's iconic and award-winning Melrose Arch.

The most eye-catching feature of the 5.8-hectare mixed-use Harbour Arch

precinct, situated at the confluence of the N1 and N2 near the CBD, will be the complex's leafy rooftop towering over the city's harbour on the one side and looking out towards Table Mountain on the other.

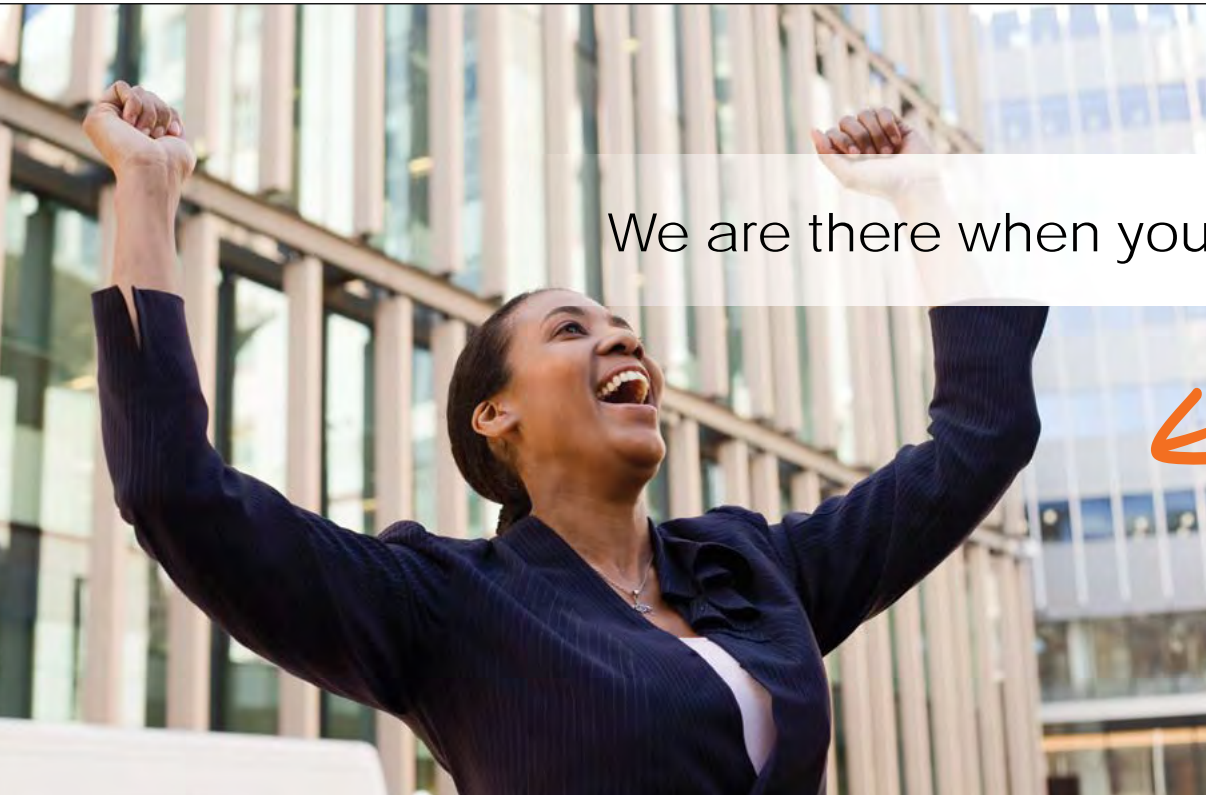
Sustainability and eco-friendly innovation will be key focus areas, incorporating

green building initiatives such as refuse recycling, water-saving devices, rainwater harvesting, a centralised district cooling facility and low-energy LED lighting.

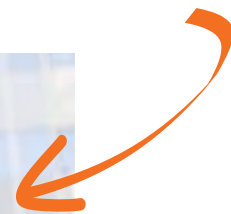
The growing global phenomenon of new urban architecture (walkable mixed-use precincts with the potential of maximising efficient water and energy use, as opposed to stand-alone buildings) will manifest magnificently in Harbour Arch – as a complex where one could live, work, play and stay in a safe, convenient, sustainable and community-focused environment.

DESIGN CHALLENGES

The scale of the development (200 000 m² of very valuable property) requires large and complicated design solutions, particularly regarding the unique landscaping layout, water-saving measures (including rain harvesting) and extensive service supply. The design also has to include future proofing slabs to allow potential conversion of possible surplus parking levels into offices or shops. The notorious Cape wind is another major factor to be borne in



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mind in the design of the individual buildings and of the precinct as a whole.

CONSTRUCTION, COST, EMPLOYMENT

Harbour Arch, positioned as a new gateway to the Cape Town CBD and valued at around R10 billion, will be a mixed-use development, constructed over five to seven years, and will comprise six individual towers, linked by a landscaped eighth-floor 'Central Park' running the entire length of the precinct. This interlinked podium level will be tenanted by restaurants, coffee shops, cocktail bars and gyms, as well as convenience retail and lifestyle outlets.

Easily accessible by both public and private transport, the development will include green landscaped public spaces, cosmopolitan streetscapes, open-air squares, pedestrian-friendly walkways, and carefully articulated indoor/outdoor spaces.



Artist's rendering of the safe and friendly Harbour Arch environment at night

The sod-turning for the first building, Tower 1 (which will cost approximately R1.2 billion to build and is expected to be ready for occupation by the end of 2020), will take place in October this year. The construction of Tower 1 will create around 2 500 jobs (with approximately

12 000 construction jobs alone on the full precinct). Beyond that, two Marriott-branded hotels destined for the site will secure about 400 permanent jobs, with retail and lifestyle spaces holding further potential for permanent positions.

Tower 1 will comprise 432 residential apartments, two motor dealerships, and retail, leisure and commercial office space. In addition to a residents-only pool, exercise area and terrace, all located on the 17th floor, the building will also feature a roof garden and viewing deck on the 24th floor. Tenders for the bulk earthworks went out in June of this year, followed shortly thereafter by the construction tender.

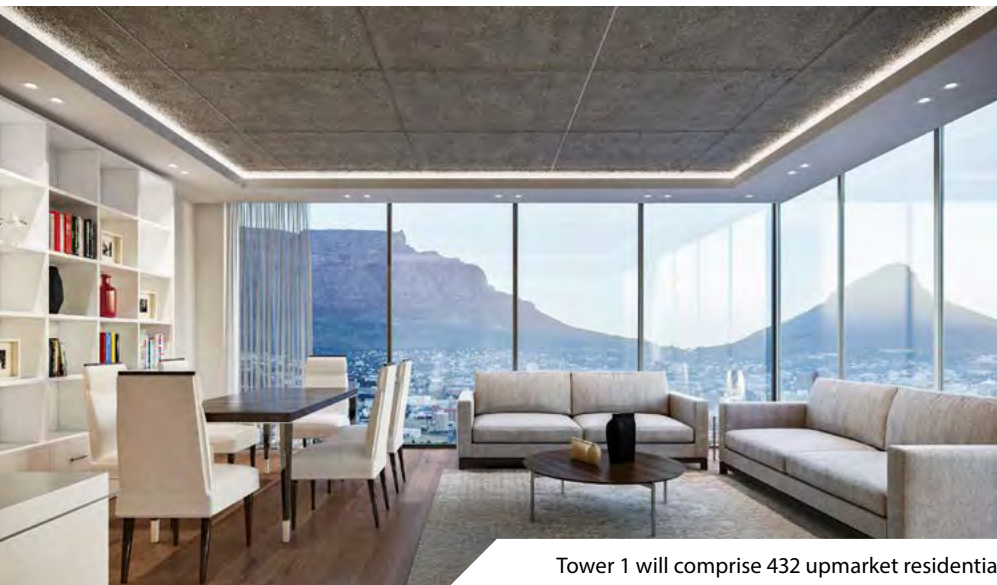
IN CONCLUSION

Smart cities combine the perks of modern technology with the feel of old-time village living – with walkable, pedestrianised streets and green spaces.

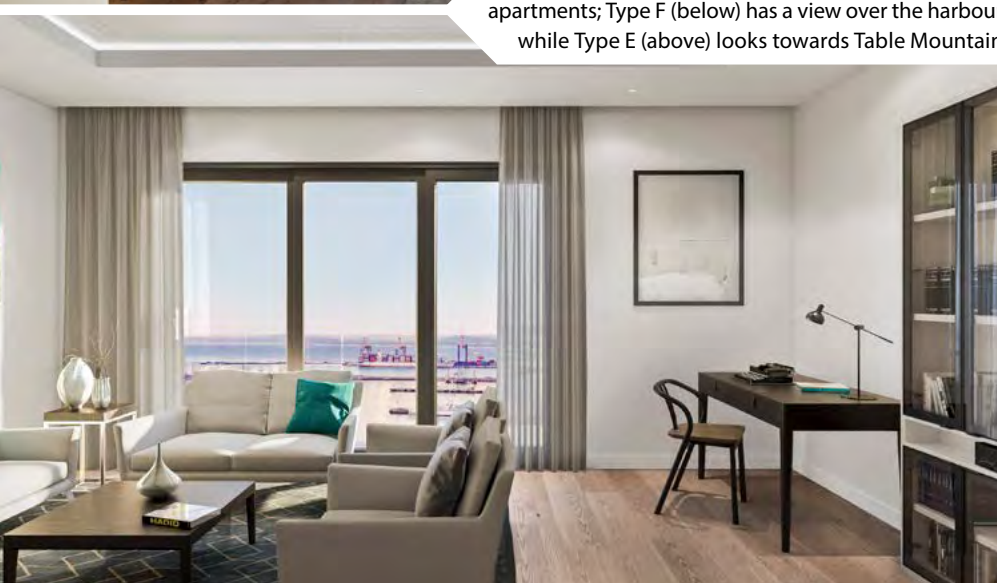
Nature has long been lauded for its positive impact on the human psyche, and there are indeed countless studies and reports on the benefits of green spaces for our mental health, so incorporating these into building design makes perfect sense.

New-urbanist precincts such as Melrose Arch and Harbour Arch revolve around the principle of being close to everything one needs in daily life, with all one's requirements accessible by foot. But it's the outdoor spaces – the piazza-style squares and courtyards for dog-walking or people-watching – that give these inner-city developments a sense of community.

Capetonians will undoubtedly be looking forward to this new development on their doorstep. □



Tower 1 will comprise 432 upmarket residential apartments; Type F (below) has a view over the harbour while Type E (above) looks towards Table Mountain



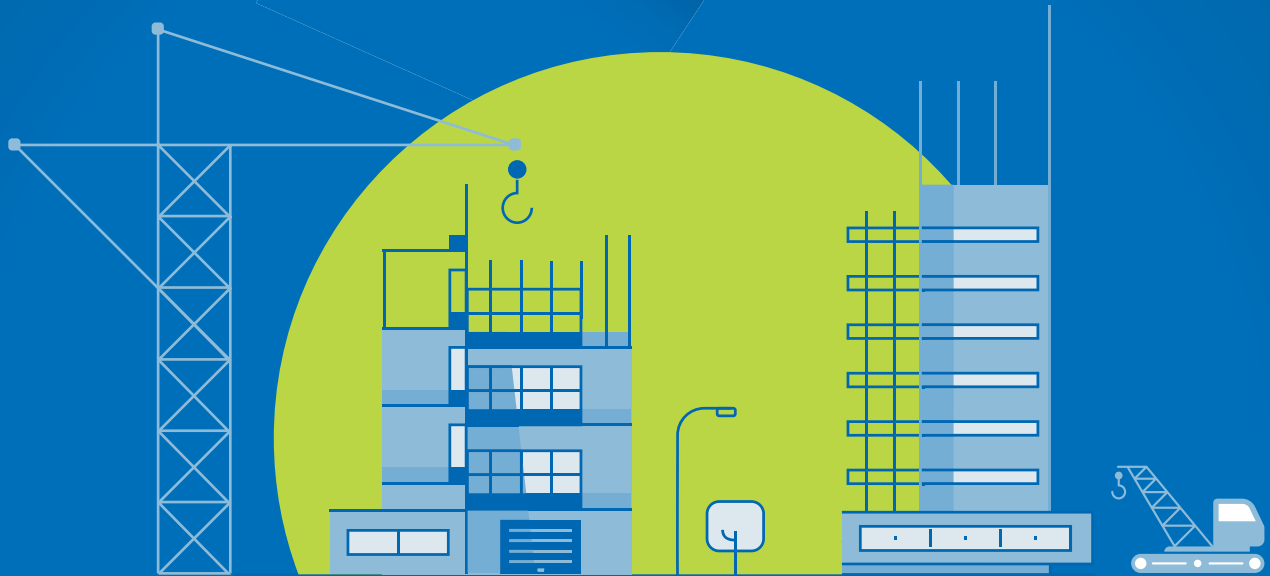
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Welcome to the Anthropocene

This article, written by Nick King, first appeared as a post on Aurecon's Just Imagine blog, and is re-published here with the company's kind permission.

A NEW GEOLOGICAL EPOCH

There's nothing more innocuous than a single sheet of cling film, wrapped around your chicken mayo sandwich. But add up all those sandwiches and suddenly you're looking at a picnic of cataclysmic proportions. Professor Jan Zalasiewicz of Leicester University has revealed that if all the plastic waste produced to date were converted to cling film, it would be enough to not only wrap billions of sandwiches and leftovers, but the entire planet! Welcome to the Anthropocene – a new geological epoch that recognises the mark that humans have made on Earth.

The concerning thing is, plastic waste is only one facet of a much larger set of interconnected impacts arising from our civilisation. With an estimated 16 million tons of plastic added to our oceans annually, combined with civilisation's other waste products dispersing into the environment, we could face everything from unpredictable climate change to mass extinction. Some would argue that the end of the world is nigh. Most would say we're to blame for it, regardless of where your apocalyptic leanings lie.

The term 'Anthropocene' was coined by Nobel Prize winning scientist Paul Crutzen in 2000, asserting that the predominance of earth's major natural systems over billions of years has been overhauled by human activity in an infinitesimal period of time. Through our insatiable appetite for fossil fuels



and other finite resources, humanity's impact has started to significantly alter the geological patterns and compositions of our habitats and atmosphere in a measurable way.

Is it really possible that the Earth, which managed to outlive the ice age and mass meteor destruction, could be derailed by the human species which, in relative terms, has just joined the geological time scale? Many scientists would say yes. Is this the end of life as we know it? Or is this another tale of creative adaptation? You decide.

A CHANGE IN THE CLIMATES OF THE CLIMATE

Pulitzer Prize winning journalist and best-selling author, Thomas Friedman, argues that we are in the middle of not one but three simultaneous 'climate changes' – one environmental, one economic, and one technological.

"First, there is climate change, and the knowledge that the time where we could

fix any *environmental* problem either now or later has shifted to needing to be fixed *now*. Next, the *climate of globalisation* has changed. The world is no longer just interconnected; it is now interdependent. Lastly, the *climate of technology* has changed; people are adapting to a world with cloud computing, artificial intelligence and big data. These changes have created a business environment where you can analyse, optimise, prophesise, customise and digitise anything," Friedman says.

If we want to discern the times, we have to start by understanding that *we have no time*. There is a sense of urgency underpinning the Anthropocene, where we no longer have the luxury of 'later'. If in the past you could delay any climate or environmental problem for later, today there is no later. Later, will sadly be too late.

The key is to study and consider these three climate changes and see how we can get the most out of these changes,

while cushioning the worst. How can we utilise technology to build agile businesses and mitigate environmental risks? How can AI (artificial intelligence) stay one step ahead of our anticipated pitfalls and outwit our demise? And, if the collective actions by humans have the capacity to bring actual change to the world, as the Anthropocene suggests, how can we turn the tables and use that ability for the good?

Interpreting and deploying these factors within the context of globalisation will determine how well we navigate through an uncertain and risky future. Our next move is critical and we have to think of a good one, and fast!

ROLLING OUT RENEWABLES' RED CARPET

Engineer and inventor, Elon Musk, would say it's not only a matter of asking the right questions. It's also a matter of time. Says Tesla's founder:

"I look at the future from the standpoint of probabilities. It's like a branching stream of probabilities, and there are actions that we can take that affect those probabilities or that accelerate one thing or slow down another thing ... If you don't have sustainable energy, it means you have unsustainable energy. Eventually you will run out, and the laws of economics will drive civilisation towards sustainable energy, inevitably."

Musk has always insisted that Tesla's ultimate purpose is not to build cars – it's to help the world to transition away from reliance on fossil fuels and towards the embrace of sustainable energy sources. The degree to which any of his inventions accelerate the advent of sustainable energy, faster than it would otherwise occur,

is the degree to which that invention will hold value down the line.

Renewable energy is at a tipping point. Wind, solar and battery energy are seeing an exponential fall in cost and an exponential rise in the uptake of these technologies. In December, Tesla officially inaugurated the world's largest lithium ion battery in Australia, making good on CEO Elon Musk's promise to deliver a solution to power outages in the state within 100 days of signing a contract. Tesla's 100-megawatt battery, located at a wind power plant north of Adelaide, can independently power up to 30 000 homes for an hour.

As we wait for major breakthroughs and game changers, such as the widespread use of solar power, second generation biofuels, and potentially transformative technologies like commercial nuclear fusion energy, Musk would be the first to agree: when it comes to renewable and other alternative energy sources, we're only getting started.

ALL HANDS ON DECK

But technological advancement can only be carried so far on the shoulders of a few individuals. "People are mistaken when they think that technology just automatically improves. It does not automatically improve. It only improves if a lot of people work very hard to make it better and actually, I think it will, by itself, degrade," Musk adds. And, if it does degrade, where does that leave us?

Ultimately, the Anthropocene calls for society to adopt an all-hands-on-deck approach to its monumental mission. Every facet of civil society – business, non-profits, academic institutions, governments, consumers, and more – needs

to be involved in the conversation.

There is no later or tomorrow or maybe next year. The time is *now*. We need to reimagine design that is comprehensive, holistic and integrative enough to offer robust solutions and help humanity to not just survive, but also thrive on a complex Anthropocene landscape.

Beyond buildings, we need to design for sustainable precincts – entire urban ecosystems that merge sustainable buildings, urban design, infrastructure and socio-economic and community needs into one organic system. Every element contributing to the flow and functionality of that ecosystem must work together to optimise its overall liveability and green design.

Imagine, for example, if every new building required a transportation plan so that the inhabitants could move between their home, work and other locations without the consumption of fossil fuel. Or, consider that by 2025 new buildings will generate 90% of the power that they consume. The implications of such designs would roll out like ripples over every sphere of city planning, rendering major shifts in the way we invest, build and envision a future-ready society.

The Anthropocene is indeed as elusive and daunting as the word itself. The global and interconnected nature of our problems could leave us wide-eyed and paralysed to act. But, the sooner we grasp the magnitude of the problem, the sooner we can spring to intelligent action and get everyone to collaborate for change. Is it too late for that? Some may say so. On the other hand, let's not sit around waiting to find out.

We are now in the Anthropocene. Time to make our next move. □

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Communicating climate change: a hot topic?

Climate change presents all kinds of communication difficulties. Too often, the key message can be confused or lost because of intrinsic scientific uncertainties. This article discusses a few key points to shape effective climate change communication.

When you talk to someone who isn't an Earth scientist about climate change, you're likely to get one of two responses: flat-eyed indifference – boredom, even – or panic. People tend to view climate change either as a problem that belongs to someone else, somewhere else, in some distant time, or as something too enormous to fathom, possibly coupled with a sense of helplessness at ever doing anything to address it.

Why the difference in reactions? Our communications company believes it is because of the way the scientific community works. Science is meant to be an evidence-based pursuit, with any claim to knowledge or "truth" stemming from repeated observations of the world both within the laboratory and outside it. These observations are couched in statistical methods and phrases: a good scientist will never say "X causes Y". He or she will rather describe a "strong correlation" between X and Y, and hedge their bets with a "confidence level". To confuse matters even further, climatologists rely on scientific modelling – observing the world's weather patterns over time, deriving rules from these observations and then constructing a model that allows them to predict

As a civil engineering professional, you play an important role in the fight against climate change. You shape the way we interact with our natural environment, whether by improving public transport systems or by building structures that reduce our energy and water usage. This means that, at times, you may be called on to communicate the importance of climate change to those who don't really know about it.

what will happen to variable X if there are changes in variables Y and Z.

All of this serves to add complexity and uncertainty to climate change theories and forecasts. These are good scientific practices, and important requirements for furthering our understanding of the world and everything in it, but they don't make for good communication. Humans are simple creatures, capable of absorbing only small chunks of information at a given time: according to Miller's law, we can only hold between five and nine items in our working memory. All this considered, it is a terrible waste of mental bandwidth to use one of those knowledge points to convey uncertainty.

As a civil engineering professional, you play an important role in the fight against climate change. You shape the way we interact with our natural environment, whether by improving public transport systems or by building structures that reduce our energy and water usage. This means that, at times, you may be called on to communicate the importance of climate change to those who don't really know about it (or, worse, don't really care). We believe that playing to the narrower end of the attention spectrum and limiting your message to a maximum of five key points will help you in this endeavour. In that spirit we would like to highlight a few salient points when it comes to communicating about climate change.

CLIMATE CHANGE IS REAL AND IT IS HAPPENING RIGHT HERE, RIGHT NOW

At the Adaptation Futures climate change conference held in Cape Town in June this year, the deputy executive secretary of the United Nations Framework Convention on Climate Change, Ovais Sarmad, noted that 18.8 million people were displaced because of climate change disasters in 2017. That's 36 people a minute. And over the past year, Cape Town's extreme water

Climate change is already happening, but we can slow it down, prepare for its effects and – maybe – lessen its impacts. If we don't act, the global situation will get worse ... much worse. No one can accurately predict exactly what will happen or on what time frame, but the general consensus is that the way we use our natural resources needs to change.

shortages have placed South Africa's vulnerability to climate change in the spotlight. Climate change affects everyone, and everyone needs to play a part in understanding, mitigating and adapting to its effects.

WE CAN DO SOMETHING ABOUT IT

Climate change is already happening, but we can slow it down, prepare for its effects and – maybe – lessen its impacts. If we don't act, the global situation will get worse ... much worse. No one can accurately predict exactly what will happen or on what time frame, but the general consensus is that the way we use our

Three steps to communicating clearly

The three steps noted here are inter-related: once you know your audience, you can distil the essence of your message. Once you have a clear message, you can focus on a few tangible examples of action. These steps are the basics that apply regardless of the length or format of your communication. Effective communication is a powerful tool. We hope these steps increase your effectiveness in fighting climate change.

1 Think about your audience

Frame your message in a way that resonates with a specific group. This demonstrates that you understand the target group's needs and context, which in turn builds trust. For example, if you are an architect talking to a builder, you may want to point out that lower volatile organic compound paints have become cheaper over the past few years. (You may also need to play an educating role. Not all builders necessarily know that volatile organic compounds are compounds that easily convert to gases, creating that "new paint" smell, polluting the air and contributing to climate change.) Similarly, if you are talking to potential investors, you may want to highlight the increasing returns on green building or on renewable energy in South Africa.

Knowing your audience is about more than just appealing to their interests or informing them of the facts. It is also about tailoring your message so that they can understand and engage with it. Is the language you're using appropriate? Will they understand what you are trying to say? If not, consider simplifying the terms you use. You may also need to think about

your tone and your objective. Do you want to inform, engage or provoke your audience? Your intent will differ depending on context – a provocative debate on climate change may be appropriate in lecture halls, but not at a municipal infrastructure indaba.

2 Keep your message clear and simple

Limiting your message to Miller's five to nine key points is particularly difficult when it comes to technical topics that involve lots of research and facts. Climate change is backed by an overwhelming amount of publicly available evidence. It is tempting to build an argument by citing fact after fact, but – despite the saying – the facts don't speak for themselves. It is up to us to use facts to build a clear, direct argument that our audience will understand. For example, if the message is that climate change is expected to devastate Africa, you probably won't need to mention climate research focused on the Philippines. Instead, you could pick two to three relevant facts and build an argument around them. Practical examples usually help people absorb an argument.

Convincing your audience requires engaging them with a message that they can visualise and remember. Think of how much of the information on climate change has been distilled into three simple, relevant messages: global warming, melting ice caps and rising sea levels. These messages are widely known because they are easy to understand. However, they are not the full picture and you may need to draw on other information to make your argument.

If you find yourself having to talk about climate change in a more formal setting, like a presentation, remember that humans are visual creatures. Figures, graphs and infographics are a great tool for conveying information in ways that are instantly comprehensible. Free online infographic tools like [canva.com](https://www.canva.com) may be useful here.

3 Include a call to action

Many people don't want to think about the bleak future that awaits due to climate change. It's natural to want to ignore a hopeless situation. But our situation is far from hopeless. We are a planet of 7.6 billion individuals who can reduce the effects of climate change if we all pull together. There is good reason to communicate a measure of optimism. Couple this with a call to action tailored to your audience, and you may just bring about change that exceeds your expectations. For example, if you are the CEO of a construction company thinking about how to build in a greener way, you could start by using the Green Business Council's green certification tool as a metric to help you understand where you need to improve. It is much easier to commit to a tangible action, such as using the tool for each project, than to commit to a nebulous final goal such as "building green". The City of Cape Town illustrated this point when it targeted individuals and companies with water restrictions; once these dropped to 50 litres per person a day, there were numerous ads illustrating how a household could use this quantity of water. These ads gave people a clear goal and increased their awareness of water use.

natural resources needs to change. If we are to correct our planet's current climate trajectory and secure the survival of our species, we need to stop damaging our climate systems by pumping out insane levels of greenhouse gases – and we need to do so quickly.

Most people are aware that greenhouse gases cause global warming, but it is incredibly difficult to change human behaviours to become more energy efficient. We have built an environment that divorces us so effectively from the means of energy production that few people make the connection between setting the office air-conditioner to 17 degrees Celsius in the heat of summer and the increase in the number of sweltering hot days. Even if they do make the connection on an intellectual level, they might just not care when faced with a very hot day. "I'll just put on the aircon for half an hour," they might say to themselves. "Half an hour won't hurt." This may be true until three million people think the same thing.

Changing the way we design and construct our buildings is one of the few ways we can reliably reduce energy usage. Hotel Verde in Cape Town, for instance, holds six stars from the Green Building Council of South Africa for, among other things, its innovative energy-saving design. The hotel is built on top of a hundred 65 m deep boreholes, each equipped with U-bend pipes. At this depth the temperature of the ground is constant, at about 19 degrees Celsius. Water gets passed down and up the pipes from the building's heating and cooling system, dumping heat underground in summer and gaining heat in winter. The ground therefore acts as a huge thermal battery.

COMMUNICATION PRECEDES ACTION

Climate change needs to become a mainstream concern. We all need to have an informed opinion about climate change and some personal anecdotes on what we are doing to combat it. We need to care about it as much as we care about the increasing price of petrol or our national sporting victories. Only when it becomes part of the fabric of our lives will we be able to act at the scale necessary to combat climate change.

In the same way that there were still people watering their front lawns in the height of Cape Town's drought, you will come across people who are oblivious to climate change concerns in your professional life. Perhaps it's an architect who still designs like its 1999, or a financier who is too focused on short-term profits and fails to consider the long-term sustainability of projects.

If you find yourself in the position of trying to persuade others to consider climate change in their approach to work or life, the pointers in the box on page 22 may be of help. These are the bedrock of effective communication in any form, regardless of the topic. Don't be deceived by how simple they seem: they can be incredibly difficult to implement correctly.

Communicating clearly and directly is often harder than we expect. It is hardest when communicating about complex problems like climate change. But this is an unavoidable step in convincing more people to take action on climate change. Engineering and built environment professionals in South Africa perform to global standards of excellence. Shouldn't our communications about the environment match? □

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Road widening in a confined environment



• Challenges

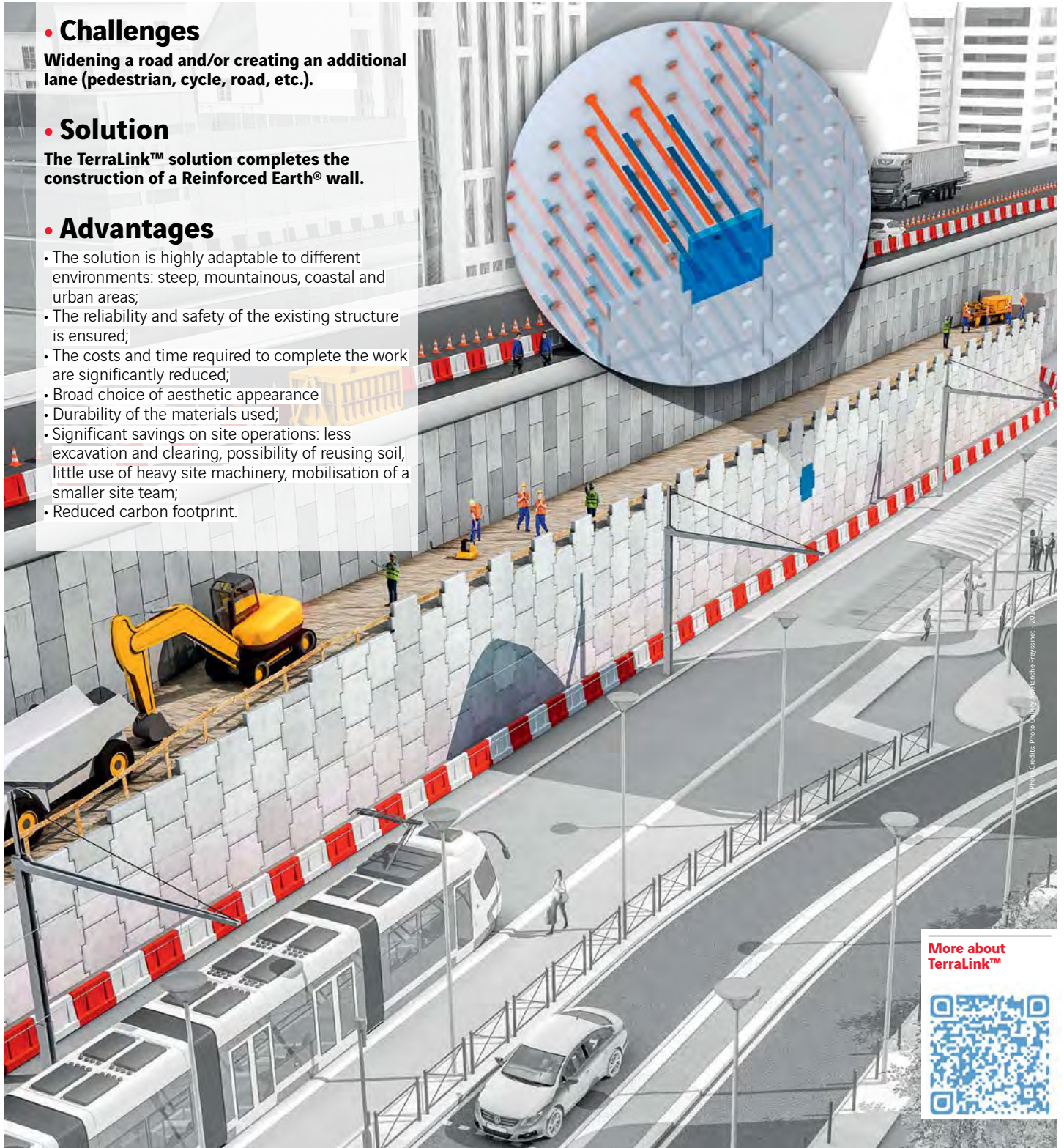
Widening a road and/or creating an additional lane (pedestrian, cycle, road, etc.).

• Solution

The TerraLink™ solution completes the construction of a Reinforced Earth® wall.

• Advantages

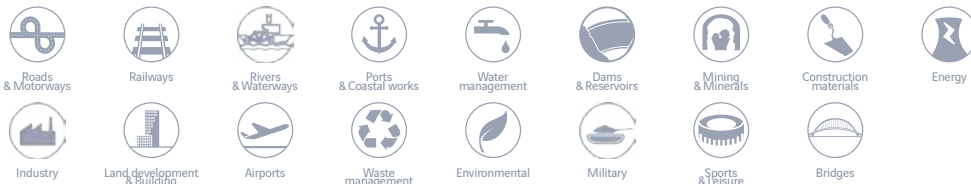
- The solution is highly adaptable to different environments: steep, mountainous, coastal and urban areas;
- The reliability and safety of the existing structure is ensured;
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- Durability of the materials used;
- Significant savings on site operations: less excavation and clearing, possibility of reusing soil, little use of heavy site machinery, mobilisation of a smaller site team;
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Introducing SAICE's new Fire Engineering Division

SAICE's new Fire Engineering Division is operational, and already has 20 members. This new division was formed under SAICE's wing after consultation (by SAICE's CEO, Manglin Pillay) with all the relevant voluntary sister engineering associations. SAICE's Council approved the move during 2017, also allowing interested members from other voluntary engineering associations in South Africa to become members of SAICE's Fire Engineering Division.

We as members of the Fire Engineering Division are excited that this division resides within SAICE, since fire-safe building fundamentally starts not only with the architect's decisions, but particularly also with the structural engineer's design for a fire-safe building envelope and a stable structure incorporating specified fire ratings. No secondary fire detection, ventilation or suppression systems can make up for a fire-deficient structure and fire-deficient materials.

WHY FOCUS ON FIRE ENGINEERING NOW?

International news over recent months has been rife with reports on tragic building system failures and loss of life due to devastating fires – the Grenfell Towers in London (72 fatalities), a shopping mall in Russia (62 fatalities), a multi-storey hospital in Korea (32 fatalities). In South Africa the devastation continued with numerous informal settlement fires, fires in a number of high-rise buildings and the large Durban storage fire that lasted for three days. In addition we saw the recurring Cape Town mountain fires and the ravaging Knysna fires which destroyed many properties and added to loss of life. The time has come for the engineering fraternity in South Africa to rise to the occasion to substantially reduce fire risk in the built environment.

In the USA and other global regions, many years of concerted effort in fire engineering, regulatory frameworks and well-trained, appropriately equipped fire-fighting services, are paying off, with a drastic decrease in fire incidents, less severity of fires, and significantly less loss of life and property.

The professional engineering community in South Africa is therefore called upon to embrace the challenges and assist with establishing a comprehensive fire engineering discipline as a formal new engineering category, supported by tertiary educational and ECSA registration. However, to establish local capability and effect improvement (including adopting best practices and engineering norms) in the short term, the focus should be to enhance and extend the local

fire engineering body of knowledge through the existing professionally registered disciplines in South Africa, as well as through liaison and partnerships with established international fire engineering societies, and universities in the United States of America, the United Kingdom, the European Union and Australia, to name a few.

Over time these bodies have developed rational fire engineering design methodologies, starting off with a focus on the occupants at risk, followed by fire engineering performance-based designs founded on proven design codes and standards and research bulletins from fire laboratories such as the Loss Prevention Council, Federal and Mutual Global, the National Fire Protection Association, etc. As a result their fire engineering designs are agile enough to prevent catastrophic failure in the event of fire. Although the primary objective remains the safety of people, ongoing research focuses on property protection and fire prevention, given the devastating effect fires have on businesses, running into billions of dollars annually.

Locally a major step was undertaken by Stellenbosch University, under the leadership of Dr Richard Walls Pr Eng, by establishing post-graduate courses in structural fire engineering, and obtaining research support from the University of Edinburgh in Scotland. Dr Walls is also liaising with educational institutions in the USA, and with the National Fire Protection Association and the Society of Professional Fire Engineers in the USA, in preparation for future graduate programmes in fire engineering and extended fire research facilities. This worthy initiative would require industry funding and sponsorships for the founding years to provide a critical number of lecturers, and to develop and validate course material and provide financial support for first-generation students in this new discipline.

WHAT IS FIRE ENGINEERING?

Different regions the world over have different definitions of fire engineering, and these also incorporate a wider group of engineering disciplines. The following are a few examples:

Institution of Fire Engineers (UK)

"Fire safety engineering is the application of scientific and engineering principles, rules (codes) and expert judgement, based on an understanding of the phenomena and effects of fire, and of the reaction and behaviour of people to fire, to protect people, property and the environment from the destructive effects of fire."

Society of Fire Protection Engineers (USA)

"Fire protection engineering is the application of science and engineering principles to protect people and their environment from destructive fire and includes: analysis of fire hazards; mitigation of fire damage by proper design, construction, arrangement, and use of buildings, materials, structures, industrial processes, and transportation systems; the design, installation and maintenance of fire detection and suppression and communication systems; and post-fire investigation and analysis."

University of Manchester

The explanations/definitions by Professor Colin Bailey of the University of Manchester perhaps align best with SAICE's interests at this stage.

According to Prof Bailey, structural fire engineering is not widely understood by those outside the discipline. Many people confuse *structural fire engineering* with *fire protection engineering* and *fire safety engineering* (the hierarchy depiction in Figure 1 refers).

"*Fire safety engineering* is a multi-discipline to determine fire safety strategy for buildings under fire conditions, in which structural stability and control of fire spread are achieved by providing active and/or passive *fire protection*."

"*Structural fire engineering* deals with specific aspects of passive fire protection in terms of analysing the thermal effects of fires on buildings and designing members for adequate load-bearing resistance and to control the spread of fire ... In principle, structural engineers should be aware of all the requirements



Figure 1 Hierarchy of fire engineering disciplines (after Prof Colin Bailey of the University of Manchester¹)

relating to fire safety in the building regulations. A very common performance requirement is that any building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period."

Prof Bailey explains further that the theory and procedures for analysing structural behaviour under fire conditions are more complex than for structural analysis and design at normal

Fire engineering in the civil engineer's house



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We are hugely appreciative of SAICE for providing a home to the Fire Safety Engineering sector. This placement inside of civil engineering is most fitting, because the discipline of fire engineering begins with the structure, whether this be in terms of structural stability, risk separation, compartmentalisation, or egress, which culminates in the structure's inherent safety (or not). From this starting point, the traditionally recognised fire interventions can then be applied to a project as the risk requires.

By engaging with a competent fire engineering specialist at project inception, many of the usual retrospective issues typically encountered can be overcome with minimal expense and inconvenience to the project's purpose. This has an even

greater value, in our experience, in terms of industrial projects where risk proximity and separation are easiest to manage while layouts are still conceptual.

In industrial projects an example of client/insurer compliance, which is seemingly becoming more popular in contract documents, is a blanket requirement for adherence to the National Fire Protection Association (NFPA) codes and standards. NFPA typically begins as a performance criteria code which requires a risk assessment and clear tracking of decision-making leading to the adoption of specific protection requirements, which are generally prescriptively described within the relevant standard. This founding risk assessment is often done retroactively once the structural design is well under way. However, engaging at the start of the design process, with reference to the performance criteria required, enables optimisation of both inherent structural fire safety and active fire protection installations. Therefore, the contractual requirement for NFPA compliance

should prompt the careful evaluation of the project in terms of its fire risk and associated safety, in conjunction with the project's final performance requirements (with respect to its commercial, residential or industrial needs).

Irrespective of the project's classification or codes employed, with the evolution of construction materials, architectural designs and functional spaces, few projects are 'simple builds' and, regardless of the end use, should have a risk assessment performed in terms of fire as one of its founding specification documents. It is worth noting that our current codes of practice already recognise and call for risk assessment as a critical part of the engineering decision-making process. In addition, even the 'deemed to satisfy' elements still require a decision based on the appropriateness to the nature of the risk.

In line with the above, this new space provided by SAICE for fire engineering enables scope for closer collaboration and optimised achievement of any project's key deliverables. □

temperatures. He divides structural fire engineering analysis and design into three levels of complexity – fire modelling, thermal analysis and structural analysis.

Most conventional building codes supply the simplest procedures, normally specifying the fire resistance required for structural members and the classification of construction based on the results of standard fire tests. Information on member dimensions and construction details with respect to fire resistance ratings are provided, with the key feature being to keep the structural members 'cool' from the heat of fires. At this level, designers need only apply specified construction features to satisfy the code requirements. This procedure is prescriptive-based.

The second procedure, according to Prof Bailey, "involves the calculation of structural fire resistance based on the empirical or theoretical relationships. Basically, the mechanical properties of the structural materials at elevated temperatures are incorporated into the traditional structural theory to develop a rational analytical procedure for predicting structural behaviour under fire conditions. This procedure, in a manner analogous to design at normal temperatures, is performance-based and provides more flexibility to designers."

Prof Bailey describes the third procedure as involving "the assessment of three basic aspects comprising the likely fire behaviour, heat transfer to the structure and the structural response. The overall complexity of the procedure depends on the assumptions and analytical methods adopted to predict each of the three design aspects. Although this procedure normally needs to be performed by experienced structural engineers with the

help of professional computer programs, it provides a platform for innovative design and construction features."

HOW DOES THIS AFFECT SAICE MEMBERS?

The development of structural fire engineering in South Africa is an important and urgent field of specialisation, since the local SANS 10400-T regulations and codes are outdated. Structural engineers who comply with these codes may in fact risk public safety. International fire codes and rational performance-based codes are updated regularly to include lessons learnt from major fire incidents. South Africa, however, currently has to adapt to and research specific scenarios unique to our country (such as informal settlement fires, for example). As mentioned earlier, Dr Richard Walls and his fire engineering team at Stellenbosh University are in the process of conducting a number of life-scale informal settlement fire tests to provide accurate science towards the development of relevant engineering solutions in future (in this regard, please refer to the article on page 32).

As a new SAICE division we invite broader participation from interested members to help us develop fire engineering into a mature discipline over the next few years. We also plan to forge closer ties with SAICE's Joint Structural Division, as we believe that such cooperation would hugely benefit our fledgeling division. □

REFERENCE

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DR QUENTIN SHAW HONOURED BY ICOLD

At the 26th International Congress on Large Dams held in Vienna in early July, Dr Quentin Shaw of ARQ was awarded the International Commission on Large Dams (ICOLD) Innovation Award in recognition of his work on stress-relaxation creep in Roller Compacted Concrete dams. Having demonstrated the increased variability of stress-relaxation creep (SRC) in different types of RCC and the increased influence of SRC on the structural function of horizontally-constructed RCC dams, compared to vertically-constructed conventional concrete dams, the necessity to consider this characteristic henceforth in the design of RCC dams has been established.

At the 86th ICOLD annual meeting preceding the Congress, the general assembly approved the new Bulletin on Roller Compacted Concrete Dams (Bulletin 177), for which Quentin was the lead author. Thanks to the Canadian and French committees on large dams, translation of the Bulletin into French is already in progress, allowing for an accelerated publication. At the same meeting Quentin was also elected as vice-chairperson of the ICOLD Committee on Concrete Dams.

Quentin was also recently elected as a Fellow of the South African Academy of Engineers, through which he is looking forward to making further contributions to sustainable development in South Africa.

Photographer: Maximilian Rosenberger



Dr Shaw presenting his innovation on stress-relaxation creep in Roller Compacted Concrete dams at the 26th International Congress on Large Dams held in Vienna



Dr Quentin Shaw receiving the ICOLD Innovation Award in recognition of his work on stress-relaxation creep in Roller Compacted Concrete dams



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Designing in the blind

REGULATORY EQUILIBRIUM

Safety is a social responsibility that has been met worldwide through the effective use of a regulatory framework that carefully balances the use of codes, standards and professional practice. The purpose of this regulatory framework is to guarantee that buildings and infrastructure meet societally acceptable levels of performance. Therefore, these three complementary approaches (codes, standards, professional practice) need to be used to achieve an acceptable level of safety. The equilibrium point between these three processes is different for different professions, different buildings or infrastructure, and different social contexts. For example, the design of the building envelope (i.e. façade systems) relies heavily on professional practice; standardised testing only provides data for a professional to execute the design, and the design outcome is an explicit measure of performance (e.g. against wind loads, durability, structural, etc). In contrast, fire safety is mostly guaranteed by codes and standards, where codes provide a predefined solution given a specific classification that serves as assurance of a socially acceptable outcome. Standards will provide measures of necessary performance (i.e. pass/fail) for components and systems. Many will argue that fire safety does not operate in a professional context, but that it is rather a regulated trade.¹ Structural engineering will operate in an intermediate space where design is done mostly on the basis of codes, but codes are written, not as predefined solutions, but as tools for a professional engineer. Structural engineering most definitely operates under the framework of a profession.

When it comes to safety, it is fundamental to constantly revisit the regulatory framework to guarantee that technological innovation, public policy, architectural imagination and economic drivers are not moving performance assessment into a space where the existing framework can no longer guarantee safety. Drivers of construction, such as economics, sustainability and innovation, are constantly redirecting practice; as a result, the balance between codes, standards and profession can shift in the wrong direction, allowing weaknesses to creep. These weaknesses can result in disasters. Disasters tend to alert society to the imbalance, and generally a correction follows – this is what we normally call “design by disaster.” It is fundamental to establish public policies that enable a constant revisiting of the regulatory framework. These policies need to be supported by regular improvements of codes and standards to meet new demands, but also by regular assessment of the competence framework that

determines professional accreditation. A brief description of these processes, as applied to fire safety, follows.

PRESCRIPTIVE REGULATION

In fire safety, the prescriptive regulatory framework relies on code-based solutions and standardised testing. Codes are structured worldwide in a fairly similar manner. First, a building occupancy is classified. This classification relies on a set of common features which enable the grouping of a set of buildings and, given their characteristics, this set of buildings will allow a similar solution that provides an adequate level of safety. Classifications could be high-rises, schools or hospitals. A classification such as a high-rise could have sub-sets, such as residential or office. Given the classification, the type of occupancy is defined next; therefore simple rules of egress, such as maximum egress distances, can be specified. Furthermore, the building will be required to have certain features that encourage idealised evacuation. Such measures are proper design of egress paths, detection and alarm systems, as well as signalling. These maximum egress distances enable the quantification of the time for egress, thus the Required Safe Egress Time (RSET).² While the quantification is not explicit, compliance with the rules assures that egress will follow a predefined process, and egress times will be within certain bounds. In a similar manner, the characteristics of the building, its fuel loads and basic geometry are bound by the classification. The codes will then require certain countermeasures (e.g. compartmentalisation, sprinklers, flammability of materials, etc) to restrict fire spread so that sufficient time is made available for egress. Once again, the evolution of the fire is not explicitly quantified, but if the rules are followed, then the fire will not lead to untenable conditions (temperature, toxic gases, etc) before all occupants have evacuated the spaces at risk. This is known as the Available Safe Egress Time (ASET).² A final countermeasure that needs to be put in place is the protection of the structure. The structure needs to maintain integrity during evacuation and through the activities of the fire service. Given the uncertainty of both egress times, and response and rescue times, codes have traditionally opted to protect the structure to withstand the worst possible fire until burn-out of the fuel. The time necessary for burn-out of the fuel is intimately related to the fuel load, and thus to the classification. Classification and solutions together form what is called the fire safety strategy. In prescriptive regulations this

strategy remains implicit; nevertheless it still provides sufficient assurance that ASET>>>RSET.

Standard testing assesses the performance of the different components of the fire safety strategy. Most of the components used for fire safety are very complex in nature; thus models of performance are complex and difficult to use. Therefore, the most common means of performance is by way of standardised testing. Some tests are simple tests of comparative performance, where the use of a certain component is only allowed if it matches the performance of an acceptable instrument. This is the case with smoke detectors, where standard testing³ is a comparison of product performance against a Measuring Ionisation Chamber (MIC). In other cases (such as sprinkler systems⁴ or façade systems⁵), standardised tests recreate a scenario that is consistent with the classification, and test the product against this scenario before it can be sold in the market. In these cases a pass/failure criterion is established and therefore the applicability of the tests has to conform strictly to the classification. Extrapolation is very difficult because, in general, the scenarios used for the tests are extremely complex. Fire resistance is a slight variant on this approach; in this case it is not a scenario, but a representation of what is deemed to be a worst-case condition. ISO 834⁶ prescribes a standard temperature time curve that is intended to represent a worst-case fire scenario. While this curve is not specific to a classification, and therefore can be used as a measure of performance for multiple classifications, it does have some assumptions and limitations that need to be respected. The fire safety requirements within a classification ensure that those assumptions are met.

Individuals executing a prescriptive fire safety strategy need to follow the rules carefully. However, given the wide range of buildings within a classification, the rules necessarily have a measure of ambiguity and therefore the individual using the rules is not exempt from competency. The question of competency has long been a dilemma in fire safety and an issue that remains a sore point. Naturally, the fire brigades are considered a competent authority, and this cannot change, because a building on fire is the workplace of the firefighter. Thus, the fire service has a responsibility towards the occupational health and safety of its staff. In an environment of very rigid and adequate prescriptive rules the ambiguity is small, and limited training and experience can allow the fire service to fulfil the role of a competent authority. In a similar manner, generalist building approval authorities have taken on the same role. In some countries they are specific authorities having jurisdiction (AHJ), while in other countries they are general building certifiers, and in others a combination of all of the aforementioned. In an environment like the United Kingdom, where codes and standards⁷ are very general and ambiguous, thus allowing innovation and new products to enter the market, the dependency on competency is much higher. The training of the fire service and the generalist authority becomes insufficient, and there is a need to redefine the design process around a professional framework.

As explained above, at the core of a prescriptive fire safety strategy is the classification. If a building cannot be classified then it can either be modified to meet the classification or it needs to be dealt with by a professional. Professional treatment requires the explicit demonstration that ASET>>>RSET, but also the analysis of standardised and non-standardised test data to extract the information necessary to adequately address performance.

PROFESSIONAL COMPETENCY, CODES AND STANDARDS

A professional is an individual who, through his/her attributes and competency, is capable of using engineering tools, codes and standards as input towards an explicit design. The professional has to be adequately accredited within a professional framework and by a group of accredited professionals. The professional shall master the fundamental knowledge behind the discipline, as well as have sufficient experience to be able to apply this knowledge towards design. Generally, professional accreditation requires a proof of basic knowledge, and this is called first-tier accreditation. This proof is delivered by successfully completing a higher-education programme accredited by the profession and/or by examination. Once the individual demonstrates mastery of the basic knowledge, then the individual can enter practice in the form of an apprenticeship under the supervision of an accredited professional. What follows is a demonstration of competent practice, which is called second-tier accreditation. After successfully completing this process, the individual is admitted to professional practice and can apply for registration. Registration requires the constant updating of knowledge and experience; thus professional accreditation requires constant review. A professional is required to keep up with technology. Most professions have well established processes that are very similar to what is described above.



The Lambert Gallery in Toronto (designed by Santiago Calatrava) is an example of a repurposed open area converted to an interior gallery by joining multiple existing buildings, which could complicate evacuation when a fire breaks out



The Bank of China in Hong Kong (architect: I M Pei) – the façade systems and building envelope technologies of this building and other adjacent ones necessitate a detailed fire engineering analysis



520 W 28th Street, New York – this condominium by Zaha Hadid uses a unique combination of geometry and materials that challenge the conventional control of external fire spread

The fire service will have a similar process for the task of fighting fires. However, with very few exceptions, this is not the case for understanding building performance.

The most important weakness in fire safety engineering today is the lack of a first-tier accreditation process in this field. Most professions will have a path for individuals with no first-tier accreditation to enter the professional realm, but these are exceptions who are rigorously scrutinised. In the absence of first-tier accreditation there is no guarantee that the individual has the fundamental knowledge, nor that all the scrutiny and filters common to higher education have been enacted. Professional institutions are therefore very careful when admitting someone to practise without such first-tier accreditation. Currently, only a few programmes hold first-tier professional accreditation globally for fire safety engineering, but even for these institutions the process followed for accreditation has not been fully rationalised or kept up to date.⁸ Second-tier accreditation is currently granted in many countries through the exception scheme. Given that all applicants fall within the exception, and there is no well-defined framework of required knowledge, the process of second-tier accreditation has questionable value.⁹ In the absence of a true first-tier accreditation process, fire safety cannot be deemed a profession and remains under the framework of a trade.¹

The absence of a professional framework severely limits the progress of fire safety. In principle it restricts its implementation to a purely prescriptive approach. Furthermore, it requires that codes and standards have limited ambiguity, which results in a very strong barrier towards innovation and progress. Nevertheless, this approach, while limited, still delivers an adequate level of safety.

The real question is: are we following this approach? The answer is a clear NO. Currently codes worldwide are falling behind. Even in the more strict environments, the forceful introduction of technology by economics (e.g. structural optimisation challenging the principles of fire resistance), by public policy (e.g. introductions of insulated – cellular plastics – façade systems

as a response to sustainability requirements) or by aesthetics or functionality (e.g. large-volume spaces as a challenge to smoke management and compartmentalisation) have resulted in a serious lag between the codes and the reality of construction. This is of critical importance in both developed and under-developed countries, because technologies migrate fast, but the speed of code reform is inversely proportional to development.

Currently we are observing two scenarios that should serve as warnings to the construction industry that codes have fallen behind. These two scenarios are large fires in timber buildings under construction, and external façade fires. The latter have already claimed many victims and yielded a dramatic example of an inadequate fire safety strategy in the Grenfell Tower Fire.¹⁰ In the case of timber buildings under construction, a combination of new technologies (i.e. engineered timber products) and optimisation of the construction process results in a construction site that does not meet acceptable requirements of fire safety. So far we have done little to address these very serious warnings.

The main reason why very little has been done is because we still have to fully understand that the introduction of new processes and new technologies are not challenging the solutions proposed by codes and standards, but the basic assumptions and principles behind the classification. A clear example of this is the case of façade fires. For a building to be classified as a high-rise it needs to exceed a certain height. However, the solutions associated with this classification require that each floor should be isolated from the floor above and the floor below so that the fire will not spread vertically. This requirement is a fundamental pillar of the classification.¹⁰ When a building envelope is used, maintaining the fire within one floor becomes a very difficult task. Current standard tests are not capable of assessing the performance of these complex façade-building systems, and therefore scenario testing is rendered inadequate. This is even more complex and dangerous when these façade systems contain combustible materials. For high-rise buildings, egress is assured through a “stay-put” strategy, where only the people in the

immediacy of the fire will be evacuated. If the fire propagates vertically this strategy is rendered useless. Fire brigades arrive on a high-rise fire scene with the expectation that they will find a one-floor fire, so all their procedures are defined under that premise. Furthermore, even water supply systems are currently designed to enable fire fighting for a one-floor fire. Effective response is therefore hampered. Finally, the fire resistance principle is based on single-element testing and thus requires a guarantee for potential paths for load redistribution, which disappear if the entire building is on fire. Thus, structural integrity until burn-out is not guaranteed anymore. This example illustrates that introducing a façade system within a purely prescriptive framework, and where the design is managed by an individual who does not have the attributes and competencies of a professional, equates to designing in the blind. Blindness to the fact that design is implementing a solution for the wrong problem.

IN CONCLUSION

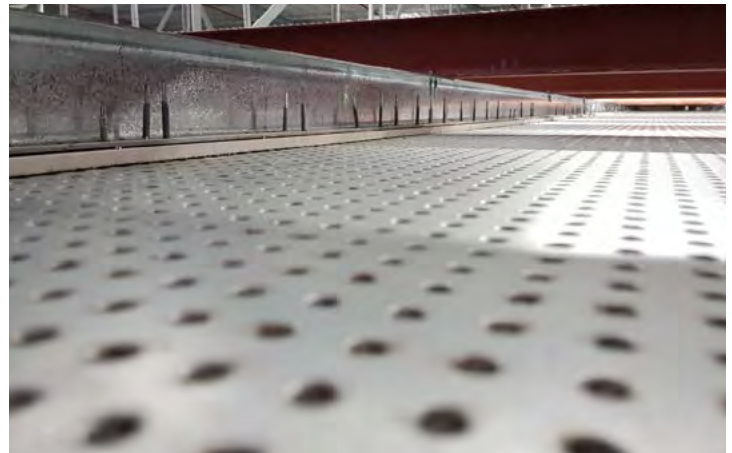
Given the evolution of the construction industry, we have no alternative but to professionalise the practice of fire safety. Society demands the same efficiencies and quality measures that other professions deliver. These drivers are strong and relentless, and the trend towards innovation, efficiency and sustainability will not change. If we remain stuck with a framework where codes and standards are used as rules and within a trade context that has no guarantee of competency, we will see fire safety crumble in front of our own eyes. This is the time to take proactive action and develop the necessary framework and educational activities that deliver an adequate professional context. ▣

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Fire engineering research and postgraduate programmes launched at Stellenbosch University



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Stellenbosch University has established the Fire Engineering Research Unit (FireSUN), which is the first university research group in Africa focused on fire safety. The team, located within the Department of Civil Engineering, will now be offering postgraduate degrees (MEng and PhD) in fire safety engineering (FSE) and structural fire engineering (SFE). This represents an exciting development for fire safety engineering in South Africa, and Africa as a whole. This article outlines the research, educational offerings and industrial projects currently under way by the team.

POSTGRADUATE PROGRAMME

In 2018 funding has been generously provided by the Lloyd's Register Foundation (LRF) for the establishment of the first phase of a fully-fledged postgraduate programme in fire engineering at Stellenbosch University, with a view that the educational competency thus established could be expanded into the rest of Africa. With Africa's increasing population, and the growth of its local mining, manufacturing and resource processing industries, the associated fire risks on the continent are rapidly increasing, along with the need for fire engineering professionals. To this end a Master's in Engineering (MEng) and PhD degrees in fire engineering have been developed in an attempt to develop the engineering capacity that the continent needs.

Table 1 summarises details regarding these postgraduate programmes and



Figure 1 Full-scale informal settlement fire tests conducted by the FireSUN team



Table 1 Postgraduate programmes in fire safety engineering available at Stellenbosch University in 2019

| Master's (MEng) | PhD |
|--|--|
| <p>MEng thesis with topics such as:</p> <ul style="list-style-type: none"> ■ Fire dynamics and design ■ Structural fire engineering ■ Informal settlement fire safety ■ Fire modelling <p>Core taught modules</p> <ul style="list-style-type: none"> ■ Fire dynamics ■ Structural fire design <p>Additional taught modules for students from a civil engineering background</p> <ul style="list-style-type: none"> ■ Advanced concrete design ■ Advanced steel design <p>Additional taught modules for students from a mechanical engineering background</p> <ul style="list-style-type: none"> ■ Advanced thermodynamics | <p>Current PhD research is focused on informal settlement fire safety, structural fire design for industrial facilities, petrochemical plant fire safety, and structural fire design in general.</p> <p>Two bursaries/scholarships are available for PhD positions in fire engineering, starting 2019:</p> <ul style="list-style-type: none"> ■ Structural fire design: Simplified design and analysis of buildings ■ Testing and CFD modelling of fire safety interventions for informal settlements <p>Full bursary provided for the three-year programme. Contact the group for more information.</p> |
| <p>* MEng positions can be reserved by companies through the sponsorship of bursaries</p> | |

topics being offered. The funding received from the LRF has allowed the creation of two taught modules in FSE, namely (a) fire dynamics, and (b) structural design for fire safety. These modules will be rolled out in 2019 and 2020, and will be available to both students and industry practitioners. Existing modules within the Department of Civil or Mechanical Engineering will also be utilised. As the research team grows and more funding is obtained, additional taught modules, such as performance-based fire design, will be developed. The main work to be undertaken by Master's students will be in the form of a full research thesis, with topics based on the various areas discussed in this article, and to suit the companies getting involved with the programme. Two full PhD bursaries are now available, sponsored by the LRF, and local or international students can apply for these, using the contact details at the end of this article.

In 2019 MEng positions are available to students from a civil or mechanical engineering background. However, due to the limited number of positions, these positions will first be available to students whose companies can provide bursaries for their own students to do the degree. Please contact the research group if you are interested in the programme.

CURRENT RESEARCH

As any good fire engineer will tell you – fire engineering is an incredibly broad field, comprising a large variety of specialist topics, such as fire dynamics, suppression system design, evacuation, structural fire design, emergency response, detection and much more. The current research group has undertaken a variety of investigations in areas such as informal settlement fire safety, structural fire design, industrial structural design, petrochemical facility fire safety, and more. Some of the bigger projects are discussed below.

Informal settlement fire safety

Informal settlement fires occur regularly and affect millions of people in South Africa. Worldwide approximately one billion people live in informal settlements (also known as slums, shanty towns, favelas or ghettos). In 2017 Stellenbosch University and the University of Edinburgh started on a project called Improving the Resilience

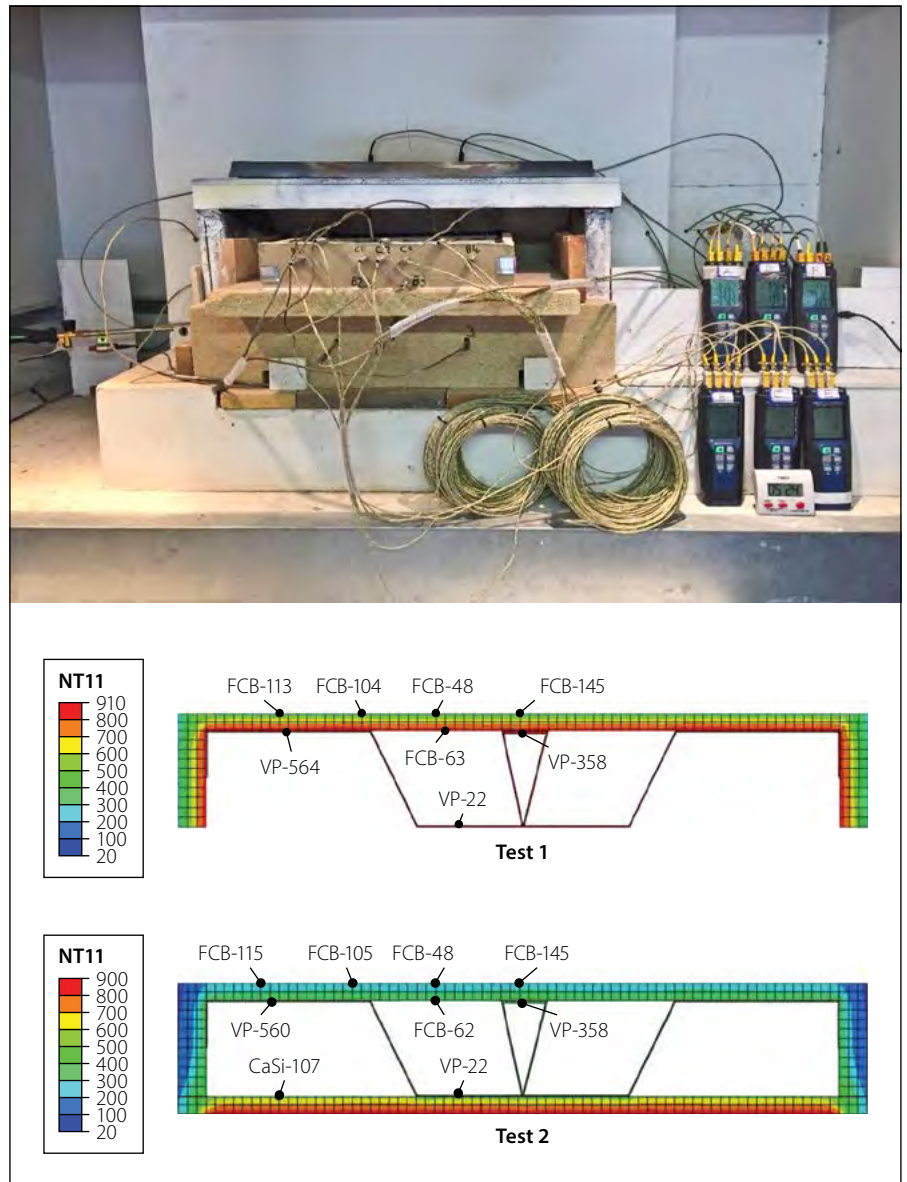


Figure 2 Small-scale furnace testing and finite element thermal analyses of a flooring system showing temperatures after 60 minutes of standard fire exposure [3]

of Informal Settlements to Fire (IRIS-Fire). This project follows previous full-scale ‘shack’ fire testing at Stellenbosch [1]. The IRIS-Fire team is busy with research work that includes the following:

- Full-scale fire testing of informal settlements where up to 30–50 dwellings will be burnt in a single experiment; Figure 1 shows a number of tests that have been conducted by the group
- Modelling of fire spread between dwellings
- Determining fuel loads from extensive surveys

- Utilising satellite imagery for tracking previous fires.

In addition to this work, the team has been closely involved with the testing and roll-out of smoke alarms in settlements across the Western Cape, as discussed further down.

Structural fire design

Structural fire design is a topic typically not well understood by most structural engineers in South Africa. It is believed that many structural engineers are signing off buildings as being safe in the case of

As any good fire engineer will tell you – fire engineering is an incredibly broad field, comprising a large variety of specialist topics, such as fire dynamics, suppression system design, evacuation, structural fire design, emergency response, detection and much more.

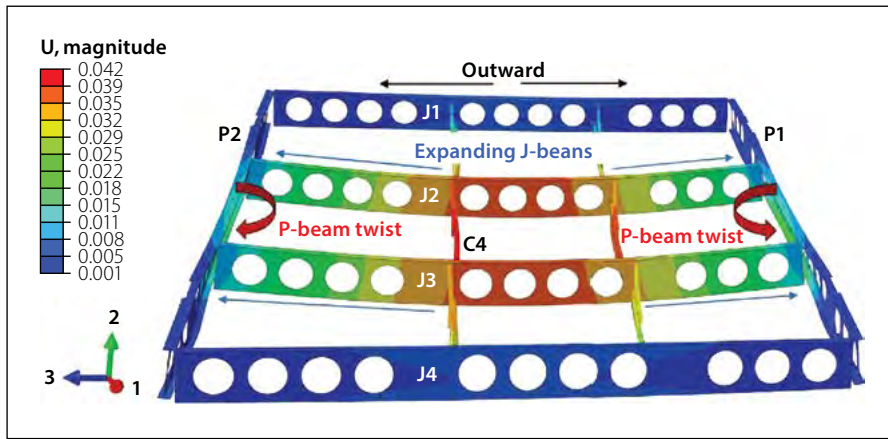


Figure 3 Finite element analysis of a cellular beam structural system developed by the Southern African Institute of Steel Construction exposed to a 60 minute fire [2]



Figure 4 Following testing done at Stellenbosch University, thousands of smoke alarms have now been rolled out across the Western Cape in informal settlements. The figure shows where activations occurred in the Wallacedene TRA settlement after the installation of a smoke detector in every dwelling [8]

fire, when in fact they are not. However, there are codified ways of ensuring that steel, concrete, timber and composite structures are safe in the case of a large fire breaking out.

The FireSUN team has been involved in various research projects on structural fire design, such as:

- Thermal and structural fire analyses of an innovative cellular steel building, as shown in Figures 2 and 3, developed by the Southern African Institute of Steel Construction (SAISC) [2, 3]
- Development of a simplified method for analysing multi-storey structures in fire [4]
- Ongoing work relating to the development of fire engineering design codes for South Africa, especially in terms of structural steelwork and the upcoming version of SANS 10162-1 [5–7]

- Design of industrial and petrochemical plants in the case of fire (ongoing PhD project).

CORPORATE RESEARCH

It is important for any research group to stay closely linked to industry and be involved in corporate engineering research. The fire engineering team at Stellenbosch has undertaken various research projects for companies, including:

- Development of a rational structural fire design procedure for the Voidcon decking system. This involved the development of design guidelines to ensure that concrete slabs built with the Voidcon system would satisfy various fire ratings.
- A current investigation, sponsored by SANTAM, is looking at the 1 000 homes that were burnt down during

the Knysna fire disaster in 2017. It is being investigated how homes could be made more resilient on the wildland-urban interface (WUI), so that fewer homes will be lost in future fires.

- Testing of suppression systems based on full-scale tests.
- Working alongside the Western Cape Disaster Management, Fire and Rescue services to investigate how smoke alarms can be used in informal settlements. In the Wallacedene TRA settlement a smoke alarm was installed in virtually every home and monitored. Real activations occurred in a number of homes, resulting in lives being saved (Figure 4 shows an overview of where fires occurred). An exciting promotional video / documentary has been produced on the project which can be found at: <https://www.youtube.com/watch?v=-z5SkDZtA3U&t=7s>.

The FireSUN Team

Although the fire engineering team at Stellenbosch University was only founded in 2017, it has grown rapidly. In 2019 it will have approximately one post-doctoral researcher, five PhD candidates, eight MEng students, and five Honour's students working on research projects. Pictures of current and past team members are shown in Figure 5.

FURTHER INFORMATION

For any additional information regarding the postgraduate programmes, current research, industry consulting or any other aspects, please contact the FireSUN team (fire@sun.ac.za). Funding and technical partners are being sought to establish a fully-fledged fire engineering programme. Please feel free to contact us in this regard, as well. □

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Figure 5 The FireSUN team (from top left): Dr Richard Walls (team leader), Dr Charles Kahanji (researcher), Antonio Cicione (PhD), Dineo Ngwenya (PhD), Njabulo Zimba (PhD), Janeke Volkmann (MEng), Jaleel Claasen (MEng – AECOM fire bursary), Junior Fourie (MEng), Stefan Loffel (MEng – AECOM fire bursary), Michael Kloos (MEng 2017), Hendrig Marx (MEng 2017) and Dr Nico de Koker (researcher – starting September 2018)

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National building regulation compliance for fire plan submissions



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For any new building or alteration or addition to a building, and in certain instances change in occupancy of a previously approved building, a building plan, as contemplated in terms of Section 4(1) of the National Building Regulations and Building Standards Act 103 of 1977, is required to be submitted to the Local Authority for approval.

Where such an application is submitted, the Local Authority may require fire plans to be submitted as part of the application. The provision to call for such plans is dealt with in Regulation A2 and Regulation A9 of Part A of SANS 10400 – A:2010. These two regulations empower the Local Authority to require Fire Protection Plans to be submitted for any building other than a dwelling (house). However, Regulation A9 (2) permits the fire-related information to be detailed on the architectural “layout drawings”, as required in terms of Regulation A2(1)(b).

The purpose of calling for a Fire Protection Plan is to satisfy the Local Authority that the functional regulations to Part T of SANS 10400 – T:2011, namely Regulations T1 (1)(a)–(e), have been satisfied. Regulation T1 (2) empowers the Local Authority to require the submission of a Rational Fire Design if, in the opinion of the Local Authority, the deemed-to-satisfy rules would not satisfy the functional regulations, or the building is a type excluded in terms of 4.1.1(b) Note 1 of Part T.

These exclusions include buildings of ten or more storeys, atriums, large

shopping centres, airport terminals and petrochemical facilities, etc.

DEMONSTRATING COMPLIANCE WITH THE NATIONAL BUILDING REGULATIONS

Adhering to the deemed-to-satisfy rules

- a. Where the Fire Protection Plan has been prepared by the appointed Professional Person (Form 1 appointment, generally the Architect) and assisted in the preparation by a Fire Consultant, under a sub-consultancy agreement, and the drawing is submitted as a plan from the Architect, then a Form 2 appointment and a Form 4 completion certificate are not required.

Procedure

Form 1:

Schedule A:

Fire Protection is applicable:

- Column 2 box is ticked
- Column 4 (in accordance with the detailed requirements of SANS 10400 – T) is ticked
- Column 5 Regulation AZ4 (1)(b) (ii) is ticked.

Schedule B:

Duty 10: should not be filled in.

Form 2: Not required

Form 3: Cannot be used

- b. Where the Fire Protection Plan has not been prepared by the appointed Professional Person (Form 1 appointment, generally the Architect) and has been prepared by a Fire Consultant, then a Form 2 appointment is required, and by extension the appointed person must meet the requirements of a competent person. Form 2 in paragraph (v)(i) gives two options,

i.e. either a competent person (Fire Engineering) or a competent person. A design that is fully compliant with the rules of SANS 10400 – T:2011 cannot be construed as a Rational Design. A completion certificate Form 4 is required.

Procedure

Form 1:

Schedule A:

Fire Protection is applicable:

- Column 2 box is ticked
- Column 4 Rational Design box is ticked.

Schedule B:

Duty 10: Indicate regulation T1 (2) and name of competent person.

Form 2:

Section 2:

The first box under (v)(i) is ticked.

- Either the 4th or 5th box under (v)(i) is ticked.
- Box for complying with the deemed-to-satisfy rules is ticked under (v)(ii).

Section 3:

- Duty 10 box is ticked
- Reference to Rational Assessment and T1(2) is scored out.

Form 3:

To be completed for any design which is carried out by another competent person (not the Form 2 appointed person) for any component listed in Annex C of Part T. Copies of any Form 3 appointments must be made available on request.

Adhering to the deemed-to-satisfy rules in most but not all respects

- a. Where the building solution complies in most but not all respects to the deemed-to-satisfy rules and therefore

the Fire Protection Plan has been prepared by an Approved Competent Person (Form 2 appointment).

Procedure

Form 1:

Schedule A:

Fire Protection is applicable:

- Column 2 box is ticked
- Column 4 Rational Design box is ticked.

Schedule B:

Duty 10: Indicate Rational Design and Name of Competent Person.

Form 2:

Section 2:

- The first box under (v)(i) is ticked
- Fifth box under (v)(i) is ticked
- Box for Rational Design is ticked under (v)(ii).

Section 3:

Duty 10 box is ticked and reference to Rational Assessment and 10400 is scored out.

Form 3:

To be completed for any design which is carried out by another competent person (Fire Engineering) (not the Form 2 appointed person) for any component listed in Annex C of Part T. Copies of any Form 3 appointments must be made available on request.

Submission requirements

A design report based on the BS 7974 framework is not required, as the competent person has elected to follow the SANS 10400-T route. A report needs to be submitted which motivates/justifies the deviation from the Part T 10400 deemed-to-satisfy rules.

Rational design

Where the applicant chooses not to adhere to the deemed-to-satisfy rules or where the building is of such a nature where the deemed-to-satisfy rules will not provide a safe solution, a Rational Design prepared by an approved competent person (Fire Engineering) is required (Form 2 appointment). A completion certificate is required.

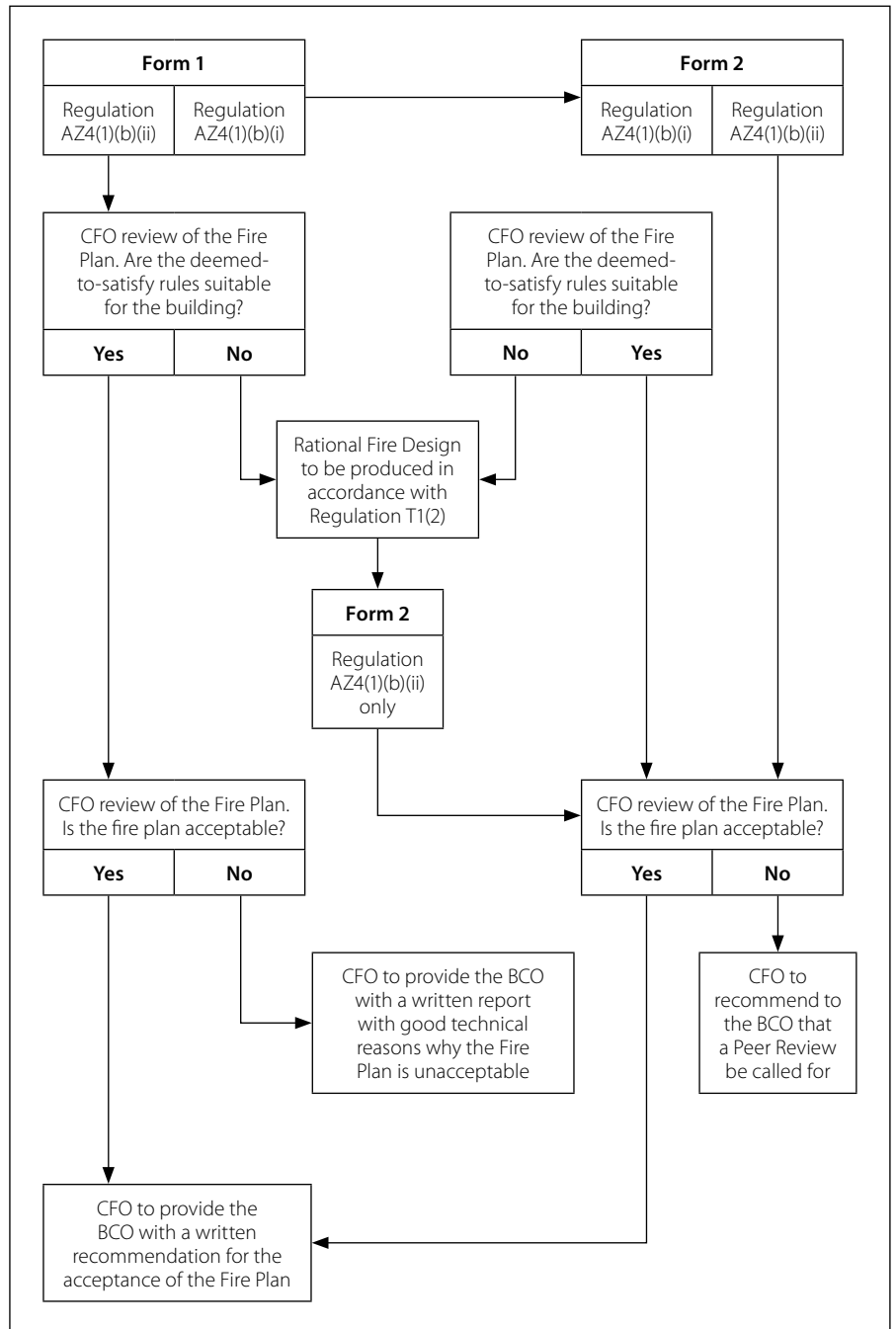
Procedure

Form 1:

Schedule A:

Fire Protection is applicable:

- Column 2 box is ticked



Summary of the procedures involved in submitting fire plans

- Column 4 Rational Design box is ticked.

Schedule B:

Duty 10: indicate Rational Design and name of competent person.

Form 2:

Section 2:

- The first box under (v)(i) is ticked
- Fifth box under (v)(i) is ticked
- Box for Rational Design is ticked under (v)(ii).

Section 3:

Duty 10 box is ticked and “Rational Design” is highlighted and initialled.

Form 3:

To be completed for any design which is carried out by another competent person (Fire Engineering) (not the Form 2

appointed person) for any component listed in Annex C of Part T. Copies of any Form 3 appointments must be made available on request.

Submission requirements

A Rational Design Report is required. As the competent person (Fire Engineering) has elected not to use SANS 10400-T as the basis of the Fire Design, and due to the fact that Annex B of SANS 10400-T is not a regulation but is a recommendation, the BS 7974 framework may be followed, but other codes and standards can be followed in order to satisfy the requirements of Regulations T1 (1) (a)–(e). □

Facts about water mist as a fire suppression solution

Sperosens, a Danfoss-Semco partner, recently embarked on developing and introducing high-pressure water mist solutions into the southern African market.

During experimental tests and demonstrations, the effectiveness of water mist was clearly visible. During a test of the cooling effect of water mist, a petrol and diesel pan fire (1 m by 1 m) was started inside a 6 m container. A pre-burn period was used to fully develop the fire and resulting heat. A sprinkler system with four sprinklers operating at a total flow rate of 1 000 litres per minute was compared to one water mist nozzle operating at 40 bar and 9 litres per minute. The sprinkler system did not manage to suppress or extinguish the fire, but the water mist nozzle was able to effectively extinguish the fire within 8 seconds.

Using a thermal camera to visualise the heat release and reduction rates, it was clearly demonstrated that, after activation of the mist system, the ambient temperature inside the container drastically reduced from in excess of 150°C to under 45°C shortly after the mist had been activated, proving the unique properties and safety benefits that water mist has to offer.

Over the past two decades, interest in water mist as a fire suppression technology has increased significantly. As the relevant technology developed, the capability and understanding of water mist also grew. By 1996 there were over 50 agencies around the world involved in research and development in water mist, ranging from theoretical investigations of the extinguishing mechanisms, to testing and development of mist-generating equipment and hardware. The major focus of this development was to show that water mist has the potential to replace traditional fire protection techniques which are often not environmentally acceptable, and also to find solutions to inefficiencies that conventional technologies cannot address.

Water mist, according to NFPA 750, the Standard on Water Mist Fire Protection Systems, defines water mist as a fine mist/fog spray where the $Dv99$ (99% of the distributive summation) of all the droplets is less than 1 000 μm in diameter. The standard also defines that low-pressure systems operate at less than 12.1 bar, intermediate-systems between 12.1 bar and 34.5 bar, with high-pressure systems operating at 34.5 bar and higher. With water mist the focus is to break the water into extremely fine/small water particles and distribute a tested and proven amount of water mist flux into the risk area.

Water mist has very favourable properties that, in many instances, make it a superior fire suppression system when compared to traditional technologies. When considering the fire triangle, current fire technologies attack only one side of the triangle, mainly heat in the case of water-based systems, and oxygen in the case of gas-based systems. Water mist has the advantage that, due to the small particle size and distribution means, it behaves like a gas-suppression agent and has the cooling properties of a water-suppression system. Water mist is divided into primary and secondary extinguishing mechanisms.

PRIMARY MECHANISMS

Heat extraction

- Cooling of the fire plume
- Wetting and cooling of the fuel surface

Displacement

- Displacement of oxygen at the flame front
- Dilution of fuel vapour

SECONDARY MECHANISMS (KINETIC EFFECTS)

When comparing water mist particle size to traditional sprinkler and spray systems, the heat extraction effect that water mist presents is vastly larger than conventional

systems. As the size of the water particles decreases, the surface area exposed for heat transfer, increases. Water mist is therefore able to absorb/remove more heat per volume of water than conventional systems. Water has a sensible heat capacity of 4.2 kJ/kg and a latent heat vaporisation of 2 442 kJ/kg. As the surface area of the droplet increases, more area is exposed for vaporisation and therefore optimal heat extraction. Water mist therefore drastically cools the fire plume (primary mechanism) and prevents escape of radiation to other fuel sources (radiation attenuation which is a secondary mechanism).

As the fine water droplets of water mist are rapidly converted to steam at the flame front, the oxygen and fuel vapour are displaced due to the volumetric expansion ratio of water to steam (primary mechanism). Water expands 1 700 times when it evaporates to steam. This expansion effect is seen as the secondary mechanism and enables the fire to 'suck' in more water mist. These properties enable water mist to be extremely effective on fires, especially on Class A, B, C and F fires.

ENVIRONMENTALLY FRIENDLY

One of the key benefits of the water mist system of extinguishing fires is that it often uses only one tenth as much water as traditional sprinklers. In addition most of the water evaporates, causing much less water damage to buildings, furniture, electrical installations, etc. In industrial applications, the dramatic reduction in direct damage also contributes towards the production line or factory being able to resume work very soon after the fire.

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Coca-Cola's investment in the Greater Cape Town Water Fund is recharging the city's largest aquifer by empowering women to clear water-intensive alien plants

COCA-COLA INVESTS IN CAPE TOWN WATER FUND

The Coca-Cola Foundation (TCCF), Coca-Cola Peninsula Beverages (PenBev) and The Nature Conservancy (TNC), along with other partners, recently celebrated the completion of a successful pilot project for the Greater Cape Town Water Fund. As a founding investor in the Water Fund, TCCF's investment of US\$150 000 has helped to clear 64 hectares of invasive plants in the Atlantis area of the Western Cape, and empowered 12 women through skills transfer and employment.

The Greater Cape Town Water Fund is working with authorities, the private sector, NGOs and communities to restore

the Atlantis aquifer, Cape Town's largest. By December 2019, the Water Fund will have replenished at least 10 000 000 litres of water to the Atlantis aquifer by clearing 64 hectares of invasive plants in the aquifer's primary recharge zone. Invasive plants, such as Australian Acacias, consume more water than the native fynbos vegetation, limiting rainwater recharge to the aquifer. The Fund employs local female job seekers to clear these invasive plants.

"Water Funds are unique financing vehicles that invest in innovative and pioneering initiatives to manage water supplies. We are very excited about

our investment in this Water Fund, in particular as it will have a positive impact on more than 70 000 people in Witvands and Silverstroom, as well as alleviate pressure and increase water security across Cape Town's water supply system, which serves 4 million people," explains Dorcas Onyango, Head of Sustainability for Coca-Cola Southern & East Africa.

Over time, the Atlantis aquifer pilot project will be scaled up to priority catchments in the Western Cape Water Supply System to secure water supply. By restoring natural vegetation cover at a large scale, the Water Fund will help catalyse a significant increase in aquifer recharge, thereby boosting water availability.

"Alien plant invasions in the Greater Cape Town region's catchments are responsible for the loss of 38 million litres of water every year, equivalent to meeting the water requirements of Cape Town for two months. The Greater Cape Town Water Fund works with partners to control thirsty invader plants, restore strategic wetlands and riverine areas, thereby addressing these water losses," says Louise Stafford, The Nature Conservancy's Water Fund Project Director for South Africa. With the continual need to remove alien plant species, a sustainable business opportunity has been developed for local female entrepreneurs, supported through The Water Fund.

The Nature Conservancy has 29 Water Funds in operation and 30 more in development – all of which are designed to protect the upstream and aquifer water source regions which provide water to large urban centres.



A few of the happy ladies who cleared a substantial stretch of alien plants, thereby helping towards saving Cape Town's water reserves

Coca-Cola's response to the crisis in Cape Town, in addition to investment in the Greater Cape Town Water Fund, includes finding alternatives to municipal water for its beverage production, as well as providing emergency bottled water supplies. "Over the past 11 years, Coca-Cola Peninsula Beverages has reduced the use of water dramatically in the manufacturing process and has one of the best water usage ratios across the Coca-Cola system. Our promise of caring for the communities we service, as well as the environment, remains of paramount importance to us as a business. We are very proud to be part of the Cape Town Water Fund, which has made great progress in such a short space of time," says Priscilla Urquhart, Public Affairs and Communications Manager for Coca-Cola Peninsula Beverages.

With water stress and scarcity being the new normal for many regions across South Africa, The Nature Conservancy calls on all partners and other investors like The Coca-Cola Company, to invest in these strategic investment models to manage water resources and optimise water supply.

Info

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THYSSENKRUPP LAUNCHES ADVANCED WATER ELECTROLYSIS FOR A SUSTAINABLE FUTURE

As renewable energy sources continue their global success story, the demand for integrating them into the current South African energy and industry landscape grows.

thyssenkrupp now offers a key technology for the integration of renewables – industrial-scale water electrolysis for large projects. Developed by experts from thyssenkrupp, the solution, which is based on worldwide leading electrolysis technologies, makes large-scale

hydrogen production from electricity economically attractive.

By splitting water into hydrogen and oxygen, this technology delivers 'green' hydrogen, a clean, CO₂-free energy carrier. The only inputs needed are water and renewable electricity from wind, hydro power or photovoltaics. 'Green' hydrogen production is ideal for long-term energy storage, hydrogen mobility and other applications, making optimal use of renewable energy sources.

The advanced water electrolysis features a well-proven cell design paired with an especially large active cell area of 2.7 m². By further optimising the proven 'Zero-Gap' electrolysis technology (leaving virtually no gap between membrane and electrodes), very high efficiencies of more than 82% are achieved.

Sami Pelkonen, CEO of the Electrolysis & Polymers Technologies business unit at thyssenkrupp Industrial Solutions explains: "With our water electrolysis process, we have successfully brought a technology to market maturity which is of major significance for energy transition. We are now able to offer our customers a wealth of sustainable solutions which will help to bridge the gap between renewable energy production and consumption. Green hydrogen as a clean, CO₂-free starting point can be used in a variety of ways – for energy storage, mobility, and the production of sustainable chemicals."

Philipp Nellessen, CEO at thyssenkrupp Industrial Solutions Sub-Saharan Africa adds: "This thyssenkrupp technology has also been developed in pre-fabricated skid-mounted standard modules, which is a huge advantage for us. We can easily deploy these modules to anywhere on the continent, with minimal construction risks." The modules easily add up to the desired project size, potentially into the hundreds of megawatt range. The patented design is based on thyssenkrupp's well-proven, leading electrolysis technologies. To date, the group company (thyssenkrupp Uhde Chlorine Engineers) has successfully completed more than 600 electrochemical plants worldwide.

"Based on decades of experience in developing and building electrolysis plants, we have designed our product to meet our clients' most important demands – easy to deliver and install, highly efficient, with minimised investment and operation

cost. And we have an industrial-scale supply chain of 600 MW per year already in place," says Roland Käppner, Head of Energy Storage and Hydrogen at thyssenkrupp Uhde Chlorine Engineers.

Within the Carbon2Chem project, one of the global flagship projects for carbon-neutral value chains, the advanced alkaline water electrolysis by thyssenkrupp, has already been commissioned successfully. It will provide the necessary hydrogen for producing chemicals from steel plant flue gas.

Hydrogen is not only a clean energy carrier, be it for long-term energy storage in the gas grid or for clean fuels, but when produced from renewable energy it can also make the production of key chemicals sustainable. One good example is 'green' ammonia – with the water electrolysis technology and its world-class ammonia process, thyssenkrupp can deliver integrated plants which can produce ammonia from only water, air and sunlight or wind. Such ammonia can be further processed into fertilisers.

Philipp Nellessen notes: "While renewables still form a small percentage of the South African energy landscape, this ground-breaking technology is potentially a fundamental building block for a variety of renewable energy initiatives that are currently on the country's Integrated Energy Plan agenda."

In addition, as a specialist in chemical plant engineering and construction, thyssenkrupp can realise additional value chains, e.g. for 'green' methanol, which could enable carbon recycling to generate sustainable fuel. Further power-to-gas solutions include methanation for the production of synthetic natural gas (SNG). As the starting point for all these solutions, water electrolysis by thyssenkrupp can help to convert today's carbon-based industry into a more sustainable, climate-friendly one.

thyssenkrupp SA actively seeks to build partnerships with South Africa's renewable energy stakeholders and invites interested parties who wish to better understand the new technology to make contact with them via their website.

Info

www.thyssenkrupp-industrial-solutions.co.za

SEWTREAT PRODUCES UNBELIEVABLE WATER SAVINGS FOR CAPE TOWN'S ONE&ONLY RESORT

Along with numerous water-saving measures already implemented at the One&Only Resort in Cape Town, the installation of Above Ground HDPE Waste Water Treatment Plants has been completed by SewTreat. The initial Phase 1 plant will remove 40 kℓ of sewage per day from the hotel's plumbing system and purify it to product water standards. The purified water will then be used in the hotel's cooling towers. This will save the hotel 40 kℓ per day in potable municipal-treated water previously utilised to run the cooling towers.

Although Day Zero has once again been moved forward after the recent rains in the area, the long-term financial implications of the drought for the tourism industry in Cape Town are undeniable. "Even if dam levels rise following the winter rainfall, the long-term impact of the drought is that a high cost for water will remain in place for at least the next five years. This has potentially devastating consequences for hospitality businesses in the Cape," says SewTreat spokesperson, Theunis Coetzer. "Looking at the current costs of municipal water and sewage treatment in Cape Town versus the savings that SewTreat's plant will achieve for the One&Only, it is clear that recycling waste water is an affordable and viable way for hotels in this region to save both water and money."

"The current cost of potable water from the Cape Town Metro is R57 per 1 000 litres and the cost of sewage disposal is R38 per 1 000 litres. In One&Only's case, because the first plant recycles 40 kℓ of sewage



The prestigious One&Only Resort in Cape Town has embarked on an above-ground wastewater treatment facility in a bid to save water

waste per day, the hotel no longer has a need to pay for 40 kℓ of water or for sewage discharge. This can be calculated as a total saving of R3 800 per day or R114 000 per month. Annually they save R1 368 million from Phase 1 alone," Coetzer explains.

Phase 2 involves the installation of a second plant that will be used to treat sewage to potable standards for re-use in swimming pools, general cleaning, washing machines and the flushing of toilets. "Phase two will see an additional 80 kℓ saving for the hotel per day. Taking into account the total saving offered by both plants, this translates to an incredible annual saving of R4,104 million, which means that the One&Only will see a full return on investment for the project in just eight months," Coetzer continues.

After both phases are complete and operational, One&Only Cape Town will

have cut potable water usage from 220 kℓ per day to just 40 kℓ per day being drawn from municipal lines. This is just 15% of the original quantity of water that they previously had to draw from the Cape Town Metro. According to Coetzer, this remaining 15% will cover the hotel's water needs for potable water to be used for drinking water, food preparation and showers. All other water requirements, such as cooling tower water, pool filling, irrigation, car washes, general cleaning and laundry will be met through recycling.

In addition to the water and cost saving advantages, the One&Only also benefits from the quick and easy installation of this type of plant. SewTreat's HDPE Above Ground treatment plants are easy to install, thanks to the minimal civil works required, while maintenance and operation of the system are effortless due to its being an above-ground system. The timeframe for complete installation of both phases from SewTreat's initial consultation with the hotel's management to being installed and completely operational was just eight weeks.

"The One&Only had previously considered desalination, but it proved to be three times more expensive than the SewTreat plant in terms of total installation costs, on-going maintenance and operation, and power usage. In addition to this it would have taken four times longer to install – by which time Day Zero could have been just around the corner," says Coetzer.

Coetzer explains further that the additional benefits for the One&Only include power usage and the monthly operational costs of the plants. "The total power consumption of SewTreat's plants



The Phase 1 plant removes 40 kℓ of sewage per day from the hotel's plumbing system and purifies it for use in the hotel's cooling towers; Phase 1 has brought about a potential annual saving of R1 368 million

is a mere 6 kw, which is comparable to the power consumption of three swimming pool pumps. Then, the monthly consumable cost of the SewTreat system is just R2 500 per month."

As part of the installation, SewTreat included an air-scrubbing system to ensure that there are absolutely no odour emissions from the plant – a must for a prestigious hotel such as the One&Only. According to Coetzer, SewTreat will also be involved in the design and implementation of 'live view' platforms that the hotel wants to install so that the water savings can be tracked in real time. "To further prove our commitment to helping them realise their water saving goals we have offered the One&Only a 100% money back guarantee should the plant not perform as per design efficiency."

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Chris Els (Manufacturing Director, Kaytech) accepts the Recycling Innovator of the Year Award from Belinda Booker, left (Project Manager, PETCO) and Cheri Scholtz (Managing Director, PETCO)

KAYTECH AWARDED RECYCLING INNOVATOR OF THE YEAR

Kaytech Engineered Fabrics has won the top award in the category of Recycling Innovator of the Year at the PET Recycling Company (PETCO) Awards Ceremony, which took place at the Johannesburg Stock Exchange on 7 June this year.

This category recognises the recycling facility that leads all other facilities in

one or more key measurements, such as innovation, volumes of PET collected and/or processed, site improvements, or sustainability measures adopted. Kaytech, as the leading geotextile manufacturer in southern Africa, is well known for producing bidim, a quality needle-punched nonwoven continuous

Lights on!



Dynapac Construction Equipment extends its product portfolio with the introduction of a full range of Light Compaction Equipment. The new range includes tampers, forward and reversible plates, walk-behind and articulated utility rollers. Customers can rely on the full support of Dynapac sales and after-market channels which offer technical service, training, parts and warranties.

Learn more at dynapac.com



Kaytech has installed 1 947 (315 W) photovoltaic (PV) panels on all the roofs of its Atlantis production facility to optimise sunlight hours, generating about 614 KW during peak exposure time

filament geotextile from rPET (recycled polyethylene terephthalate).

Although this recycling initiative is not new, Kaytech's recent investment in a second, larger and more sophisticated line at their Atlantis plant (that will more than double the consumption of rPET at capacity) has developed the processing of the rPET into an improved geotextile. Chris Els, Manufacturing Director at Kaytech, and his highly competent management team, have been instrumental in ensuring the new line delivers on this. Many innovations and modifications have been made to the process to include improved polymer extrusion, drawing of the filament, lay-down of the batt, double-needling thereof and a new compact wind-up system of the final bidim geotextile. The technology employed was not available as a turnkey solution from any one equipment supplier, resulting in the need to build such a plant from the ground up.

In addition to the ameliorated 'green' economies of scale, with the increased rPET consumption leading to greater competitiveness, another significant investment has been made at the Atlantis production facility, where the installation of 1 947 (315 W) photovoltaic (PV) panels on all the roofs to optimise sunlight hours generates about 614 KW during peak exposure time.

According to Els, "One of the biggest impacts of our business relates to the collection of plastic bottles that go into the recycling process. Based on PETCO's statistics, this translates into a considerable number of people who now have income opportunities due to the additional capacity that we are generating from our line."

This combination of job opportunities, improved processing of larger volumes of rPET and greater efficiencies using solar energy to supplement power consumption and the resultant reduction in the process footprint, clearly marks Kaytech as the leader in recycling innovation.

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EIGHTY YEARS OF VITAL DISSEMINATION OF CONCRETE INFORMATION

"The enormous collection of printed matter in The Concrete Institute's Information Centre is as relevant today as when the well-known 'concrete library' shelved its first few books 80 years ago," says Susan Battison, Information Specialist at the TCI.

The Information Centre at the TCI offices in Midrand holds the largest collection of cement- and concrete-related reference works on the African continent, arguably also in the southern hemisphere. It was started in 1938 when TCI forerunner, the Portland Cement Institute, was established, and it has been the one constant factor amidst name changes and shifts in focus which the current TCI has undergone since then.



Bryan Perrie (seated left front), MD of TCI, seen here with Information Centre staff – Susan Battison (seated), Bongani Methula (standing left) and Kizzy Shipalana

Battison comments further: "Many people think that libraries with books and papers are irrelevant because so much research information is now available on the Internet. However, internet research can be dangerous and commercially influenced. Some of the information on the web is marketing in disguise, emanating from amateurs or pseudo concrete experts posting YouTube videos and blogs. Very little information free of charge on Google is peer-reviewed or verified for accuracy and updating."

She says peer-reviews and scholarly information can be expensive to obtain, but the TCI Information Centre has a huge collection of such verified information available – free of charge. "The Centre has built up a reputation of trust within the concrete industry and is recognised as a champion of free concrete information."

Its impressive catalogue has essential information for students and concrete industry specialists under one roof and, if necessary, the centre's staff can also search global information resources, to save clients valuable time and money. Tertiary students who have progressed to becoming heads of university departments or global authorities had spent hours of research at the Midrand 'library', and this has generated immeasurable goodwill for TCI over the years.

"Our reference works now total over 130 000 items and include journals, conference proceedings, books, DVDs, standards, and historic data from an era long before the Internet existed. The TCI Information Centre caters for the needs of professional builders, civil engineers, concrete technologists, students,

lecturers, professionals, journalists, and home improvers. It has even helped school children with homework,” Battison adds.

The latest additions to its collection (and which cannot be accessed free of charge on the Internet) cover topics such as:

- Corrosion consequences for reinforced concrete structures
- Creep and hygrothermal effects in concrete structures
- Development of ultra-high-performance concrete against blasts: from materials to structures
- Glassfibre-reinforced concrete: principles, production, properties and applications
- Materials for sustainable infrastructure
- Swelling in concrete dams and hydraulic structures
- Recycled aggregate concrete structures, and
- Strain-hardening cement-based composites.

For more details about these new authoritative additions and the TCI Information Centre’s online catalogue, visit: www.tciinformationcentre.co.za/activeconnect2002/.

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ADDITIONAL FIRE PROTECTION FOR CONCRETE WITH ADFIL FIBRES FROM CHRYSO

Over the last 18 months or so various wildfires, building fires and mine fires underground served as reminders of the value of specialised construction materials in passive fire protection, especially in reducing explosive spalling.

Such a solution is the specially designed Adfil IGNIS® monofilament polypropylene fibres, distributed locally by CHRYSO Southern Africa, supplier of concrete and cement admixtures and ancillary products. Developed by Adfil Construction Fibres, a division of the UK-based Low & Bonar Group, the IGNIS fibres have been used in



Adfil IGNIS® monofilament polypropylene fibres provide passive fire protection, especially in reducing explosive spalling

concrete mixes to enhance the fire rating of concrete structures and have been successfully applied in tunnels, sprayed linings, precast segments and pumped concrete behind slip-formed shuttering.

In a move that will bring this innovated technology closer to home, Adfil last year appointed CHRYSO Southern Africa as its partner to grow its fibre business into Africa, and also arranged collaboration between Adfil and specialist South African company Oxyfibre, which has developed patented surface technologies and nano-technologies for polypropylene fibres.

According to Izak Louw, operations manager at Oxyfibre, fire can cause explosive spalling in concrete structures when ‘free water’ in the concrete pores – water that has not been consumed during the hydration reaction and remains unused in the concrete – becomes steam when exposed to fire and causes explosions that break up the concrete.

“Falling concrete then presents a serious safety risk, and the integrity of the concrete structure is also compromised,” says Louw.

To enhance the fire rating of concrete structures and reduce the risk of spalling, Adfil’s polypropylene fibres are added to the concrete mix for the purpose of increasing permeability during heating, thus reducing pore pressures.

“In the case of fire, the fibres will start to melt when the heat of the concrete is approximately 160°C,” he says. “When the temperature reaches 360°C, the fibres will disintegrate to provide millions of capillaries in the concrete for the moisture to escape. The result of using these fibres in concrete is that there is no build-up of pressure and hence no explosive spalling.”

According to Louw, the use of specialised fibres in concrete as passive fire protection can prevent the catastrophic failure of concrete structures – from mine tunnels to high-rise buildings.

“Furthermore, polypropylene fibres offer a three-dimensional system, which helps to prevent shrinkage cracks from occurring,” he says. “The fibres increase the tensile strain capacity of the mix at the plastic stage, while crack control reinforcement would merely hold the cracks together once the concrete has failed.”

Proven at such test facilities as TNO in Holland and the BRE in England, Adfil IGNIS® has been used in many road tunnels, primarily to avoid the potential collapse of these structures in the event of serious fires.

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SMEC DEVELOPS MASTER PLAN FOR AN OIL AND GAS INDUSTRIAL PARK IN UGANDA

Global consulting engineering firm SMEC, part of the Surbana Jurong Group, was engaged by the Ministry of Energy and Mineral Development of Uganda to develop a Master Plan for an Oil and Gas Industrial Park in Kabaale, western Uganda.



Artist's rendition of the oil refinery, which forms part of the planned new Oil and Gas Industrial Park in Kabaale, western Uganda



Artist's rendition of the planned warehouse zone within the Industrial Park



Artist's rendition of the office and mixed-use section of the Industrial Park



Artist's rendition of the district hospital which will be situated in the future Industrial Park

As a result of the discovery of oil in the region, and the need to maximise value from the resource, the Government of Uganda has allocated approximately 3 000 ha of land for the project, making it one of the largest industrial parks in the world.

The Industrial Park is intended to form part of a new industrial city encompassing an oil and gas refinery; energy, petrochemical and other strategic industries; an international airport; commercial and administrative areas; health and education facilities; residential neighbourhoods; public spaces; free zone, oil and gas export hub; and green areas.

“The park will have first-class facilities, utilities and advanced security built to the most up-to-date standards and practices,” explains Godfrey Hatejeka, SMEC’s Utilities Engineer in Uganda. “All this will be centrally controlled with a SCADA system.” Hatejeka has been responsible for facilitating meetings between stakeholders and government bodies, coordinating both local and international project experts, and ensuring adherence to the scope of the contract and SMEC reporting standards.

During construction the refinery will create approximately 5 000 jobs, and approximately 650 jobs during operation. When operating at full capacity, the Park will provide over 30 000 direct jobs and about the same number of indirect jobs.

The Industrial Park will contribute to the overall development of the Ugandan economy and also facilitate the growth of the neighbouring trading centres like Hoima, Kabaale, Buseruka, Kaseeta, Kataba and others by providing support services to the Park.

“Being the first project of this nature in Uganda specifically, and East Africa as a whole, the Government of Uganda relied substantially on SMEC expertise for setting the project key performance parameters and training its staff on implementing this mega investment,” says Hatejeka.

He concludes, “With SMEC’s global service capability the project was executed within the contract period and budget parameters, to the satisfaction of the client.”

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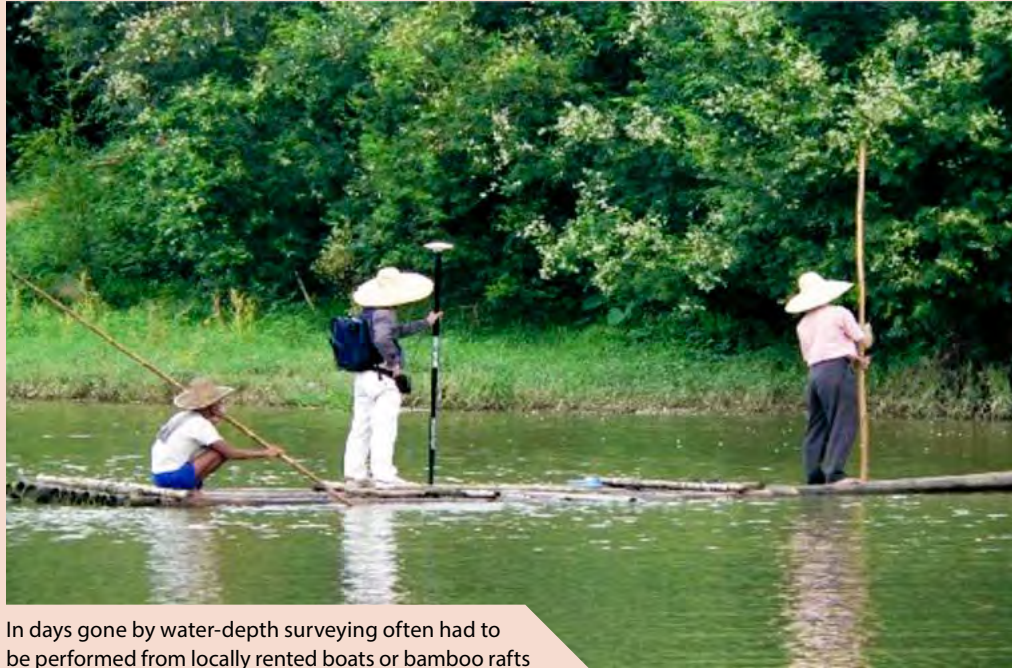
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USV SIMPLIFIES HYDROGRAPHIC SURVEYING

Water is a basic but amazing element for all creatures on earth. In every great ancient civilisation at least one important river furnished the land and its inhabitants. Nowadays around 95% of cities, towns and villages are in close proximity to rivers, brooks or wells. As the world becomes more industrialised, the interaction between humans and water is increasingly pronounced, with more bridges crossing rivers, and more harbours under construction. However, water and traffic authorities worldwide often face serious design and implementation challenges in a fast-urbanising environment.

Over the years sophisticated hydrographic surveying techniques and tools have been developed – such as multi-beam echo sounders, side-scan sonars, sub-bottom profilers, LiDAR – which greatly assist the civil engineering work that is done for public authorities and the private sector. This is a far cry from days gone by when water-depth surveying had to be performed from locally rented boats (even bamboo rafts or sampans in shallow water), mounting surveying equipment precariously on board and dealing with the turbulence caused by currents or passing boats.

This short article briefly describes two projects in China where hydrographic



In days gone by water-depth surveying often had to be performed from locally rented boats or bamboo rafts

surveying solutions were introduced to address challenges around safety, accuracy and efficiency.

Surveying a heavily trafficked channel

Since 1979 the product-rich Pearl River Delta in China has become one of the most important industrial areas in the country, with more than 30% of “Made in China” goods being produced there and exported to the rest of the world from that area. The water network and its numerous harbours and channels are a hive of activity, and play a very important role in goods export and raw materials import.

Plans to install more pipelines to convey electricity, gas and municipal

water across some channels required the contractor to survey these channels to determine the latest water bed depth before laying the pipes. One of the main channels (Modao Gate Channel) that needed to be surveyed in this manner is an 89.5 km long, 3 000 tonnage vessel waterway, with more than 30 ports supported by thousands of factories, and which carries more than 800 vessels per day.

Traditional cross-section surveying in this heavily trafficked channel could have seriously jeopardised the safety of the surveyors. A solution therefore had to be found to hydrographically survey the channel (and four others) to an

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THIS IS WHY
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Swift and intelligent surveying USV

- 4.5m/s speed powered by ducted propellers
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- Professional sounding module range up to 300m
- Auto-return while low battery or dropped signal



The lightweight USV, with its sturdy design and automated systems, is increasingly being used to safely survey rivers, busy channels, shallow water, lakes and reservoirs

accuracy level of within 20 cm, and at a reasonable cost.

USV system an ideal solution

The Unmanned Surface Vehicle (USV) proved itself to be the ideal solution to complete the work safely and on time.

The USV iBoat BM1 can work for more than 12 hours continuously on auto-pilot, providing a precision survey to within 10 cm. The boat is also pre-set to automatically return to base when the signal is lost or the battery starts running low. The real-time camera data transmission assists surveyors to monitor the boat from the side of the channel (or the bank of a river).

This advanced automatic system comprises the vessel body, the echo-sounding and positioning module, the data communication system and the control system.

Survey lanes are designed on the USV pilot software, backgrounded by online Google satellite images. In this manner the interval and length

of each cross-section lane can be implemented easily.

The USV can be sailed automatically or manually, with users being able to switch the working mode in real time. During a surveying task the USV can therefore be manoeuvred easily to protect it from colliding with ships. This flexibility and swift performance guarantee the lightweight, unmanned boat's safety and efficiency.

The real-time surveyed data is transmitted from the boat to a laptop where the operator can easily monitor the position, heading and depth, and from where he can control the parameter setting for the sounding system on the safe bank area.

Long river, limited time, shallow water

Although it is not deep enough to carry big ships, Hun River, also known as the "Mother River", is nevertheless important to Shenyang City, the capital of Liaoning Province, as a vital additional source of municipal water. The Water Resource

Authority of Shenyang City needed to monitor the hydrographic condition periodically for civil security, waterfront maintenance and sustainable development studies. However, this could not be achieved using traditional hydrographic surveying methods, due to various hydraulic and traffic safety factors unique to the situation. As with the Modao Gate Channel described above, the USV system offered the ideal solution to complete a hydrographic survey (at 20 m section intervals) of an 80 km stretch of the river in the shortest possible space of time. Using the USV iBoat BM1, the job was completed within 14 days, which is a dramatic improvement on traditional ways of operating.

Conclusion

The lightweight USV, with its sturdy design and automated systems, is indeed a smart platform that is increasingly being used to safely survey rivers, busy channels, shallow water, lakes and reservoirs.

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The components of the Unmanned Surface Vehicle (USV)



From a 60% contribution, the large construction companies now account for only just over 40% of market share

CIVILS IN SURVIVAL MODE FOR 2018, BUT 2019 HOLDS HOPE

The construction sector – and particularly civil engineering – will remain in the doldrums for 2018 with hopes for some improvement to begin next year, according to Industry Insight senior economist David Metelerkamp.

Speaking to construction industry stakeholders at a recent AfriSam breakfast briefing on the State of the South African Construction Industry, Metelerkamp said that the civils sector was bearing the brunt of the construction downturn, and companies reported the worst levels of confidence since the early 1990s.

“Over the last 18 months, there has been a significant decline in the value of tenders awarded,” he said, pointing to a 26% decrease in the value of projects over the past year.

He highlighted that order books across the civils sector remain flat, and even dropped in recent months, possibly as a result of President Cyril Ramaphosa’s planned clean-up of the state-owned enterprises which had in some instances delayed expenditure. But he saw more efficient SOEs as a positive factor in the medium to long term for civils.

“Conditions will remain tough this year, which will possibly be the worst year for the civils sector,” he said, “but we are expecting some improvement next year and the following year.”

The civils sector had experienced poor annual growth levels for many years up to 2016, after which its performance had worsened further with five consecutive

quarters of negative growth. Some good news came recently with Energy Minister Jeff Radebe’s interventions to progress 27 independent power producer agreements; Metelerkamp noted that civils contractors would have to rely more on private sector contracts like these. There might also be good news in store as the next national election looms, with an election run-up often coinciding with the issuing of more government tenders.

In the interests of transforming the sector, government has also been breaking up large infrastructure projects into smaller pieces to allow greater access by small contractors; these smaller players have therefore taken over a substantial portion of market share from larger contractors.

AfriSam’s Chief Executive Officer, Rob Wessels, emphasised the positive role that construction played in creating employment. Urging greater partnership between the stakeholders at the briefing – which included construction firms, retailers, trade unions, management, material suppliers like AfriSam and industry associations – Wessels said that, while construction contributed around 3% of gross domestic product, it employed roughly 9% of South Africa’s labour force. The sector employs about 1.4 million of South Africa’s total workforce of approximately 16.3 million people.

“The construction sector is labour-intensive, and if our President’s vision of creating another one million jobs over the next five years is to be realised, a significant



According to senior economist David Metelerkamp, flats and townhouses will drive future growth in the residential segment

portion of that will have to be achieved by the people in this room,” he said.

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M&D Construction Group's Pipe Laying Division recently became the first South African contractor to have its workshop certified to ISO 3834 quality standards

M&D CONSTRUCTION GROUP SETS THE BENCHMARK IN PIPELINE QUALITY STANDARDS

M&D Construction Group, a civil engineering construction and building specialist, continues to take proactive steps to ensure that the highest quality standards are maintained when it builds critical infrastructure for its many public and private sector clients.

The company's Pipe Laying Division recently became the first South African contractor to have its workshop certified to ISO 3834 quality standards by the South African Institute of Welding (SAIW), the International Standards Organisation's authorised national body for company certification.

This state-of-the-art facility in Kya Sands, Gauteng, is the heart of the group's Pipe Laying Division, one of only a few contractors in this specialised field that has the internal skills and capacities to construct large steel pipelines of up to three metres in diameter.

These extensive capabilities have been deployed on a number of critical pipeline projects for fuel and gas producers, mining houses, water utility boards and municipalities, amongst others.

Rukesh Raghubir, the group's chief executive officer, says that this development is a pre-emptive response to the continuous drive for excellence by participants in specialist industrial sectors of the economy, as well as by various government bodies.

"It has significantly bolstered our already robust integrated systems to ensure

the highest possible standards are met, in terms of quality, in addition to health and safety, as well as the environment. It reaffirms our commitment to deliver a level of quality that matches our industrial clients' own quest for excellence. Meanwhile, this approach also greatly assists government in safeguarding against the construction of inferior infrastructure, which is becoming a growing concern in the public sector with the arrival of so many unscrupulous operators who threaten to bring the entire pipeline industry into disrepute."

Lance Cox, the group's safety, health environment, risk and quality manager, led the team that was tasked with ensuring that the workshop complies with the rigorous requirements of ISO 3834, a more specialised and onerous standard that, therefore, immediately confirms the high quality of fabrication undertaken at the workshop.

"It specifically guides the procedures of all operations involved in the fabrication of high-quality steel pipe componentry, including the many critical 'bends' that are used on a typical pipeline project," Lance says.

"For example, it prescribes processes and periods for the storage of consumables and the correct calibration of testing instrumentation. This is in addition to the procedures and timelines for the maintenance of welding equipment, confirming

the competency levels of our skilled welding team and the non-destructive testing processes we adopt on our sites."

Sound record-keeping is also a critical requirement for retaining accreditation, while all documentation has to be safely stored for no less than 12 years, as opposed to only three to five years as required by other more generic standards.

Moreover, it promotes a culture of accountability by establishing a single point of contact for all queries relating to the quality of welding undertaken by M&D Construction Group's Pipeline Division.

This formidable responsibility is being shouldered by Gerrie Le Grange, pipe quality manager.

Le Grange, together with Pieter Naudé, senior quality officer, and Gerhard Faber, engineering manager of the factory, also played a key role in ensuring that M&D Construction Group passed the SAIW's rigorous, extensive audit.

The process commenced early last year and Lance says that, during the preparation phases, he also received positive feedback from some of the Pipe Laying Division's clients regarding their interest in complying with the requirements of the ISO 3834 standard. One of these is a prominent participant in the oil and gas sector who demands that extremely high standards always be met and maintained by both industry participants and their supply chain partners.

Meanwhile, prominent public sector client bodies have become even more discerning when evaluating tenders for the construction of their water pipelines, many of which traverse vast distances in outlying rural areas, to efficiently deliver the 'life bringer' where and when it is required.

"I expect this trend to continue, considering the profound negative impact that the drought has already had on so many areas of the country. The situation has highlighted the need to maintain, upgrade and build new quality infrastructure, with some areas of the country already having been declared national emergencies," Lance says.

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Photogrammetric modelling as an engineering tool

INTRODUCTION

We live in an era where technology appears to be directing itself in increasingly more innovative ways in order to produce more incredible and novel results for use in the engineering industry. One of these more innovative technologies is using photographs to produce a three-dimensional (3D) photogrammetric model. Bentley Systems' ContextCapture offers this functionality, relying on a simple input technique of using photographs to produce what is in effect an astonishing result. This technology has the capacity to change the way that engineers, quantity surveyors and town planners think about doing many discipline-specific tasks.

Traditional area mapping and survey techniques have included, inter alia, LiDAR, remote sensing using satellites (e.g. Landsat), theodolite surveys and topographical land surveying. Now, simple photography is able to play a pivotal role in this field of the science of data acquisition.

DESCRIPTION

This relatively new survey technique is based on photogrammetry, which is almost as old a concept as modern photography itself. ContextCapture's development began in 2011, and has been available since 2015. The technique uses simple photographs to make intelligent 3D models of objects, sites, roads, bridges, large tracts of land, industrial complexes – whatever the needs of the

user are. In this article we will further explore some of the possibilities of this technique.

TECHNIQUE

Many types of cameras may be used to capture an input dataset for ContextCapture, ranging from cameras mounted on drones, smartphone cameras, DSLR cameras, and so forth. The quality of the photos will of course determine the quality of the resulting 3D model that is generated by the software. GPS-enabled devices are most advantageous in georeferencing the output easily.

In essence, the technique is able to turn a series of specifically planned photos into an intelligent 3D model that can in turn be used by other programs for whatever the required application is. Enough

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photos should be taken of the entire object or scene that is to be reconstructed in the model – the basic requirement is that each point of the object scene must be photographed in at least two adjacent photos. Figure 1 gives an idea of the position and number of photos required for a typical object.

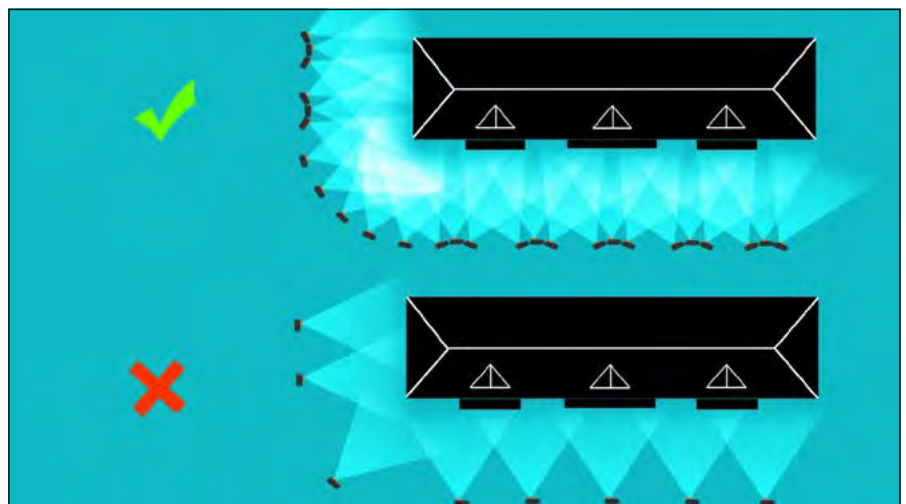


Figure 1 Capturing the data for traversing the corner of a house
(Credit: Bentley, ContextCapture, Guide for photo acquisition, 2015)

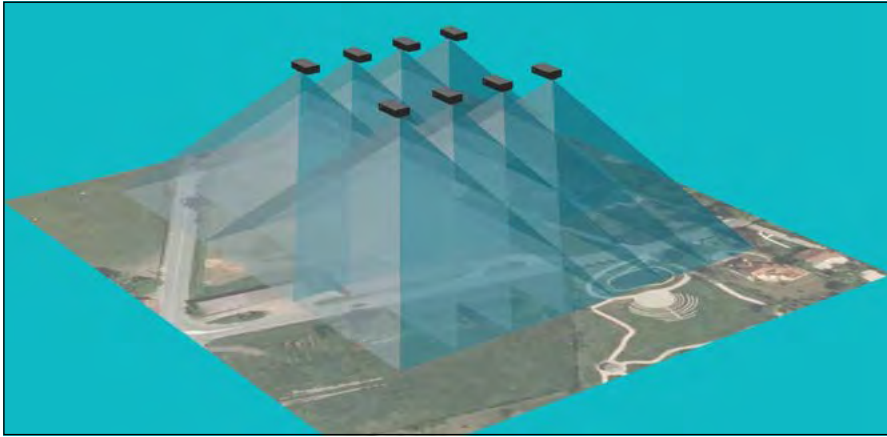


Figure 2 Overlapped areas required for ortho photography
(Credit: Bentley, ContextCapture, Guide for photo acquisition, 2015)

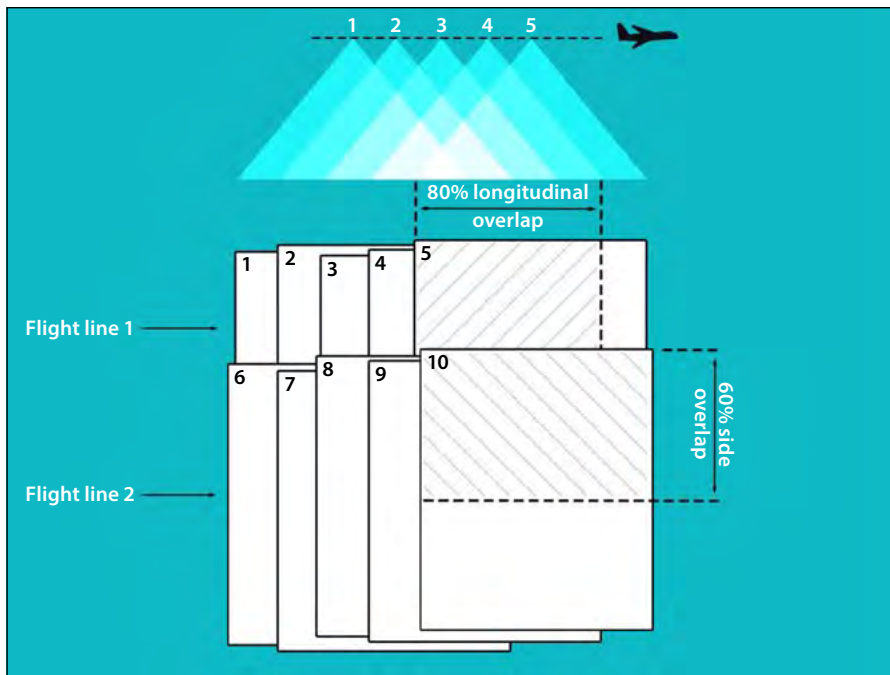


Figure 3 Overlap flight line requirements
(Credit: Bentley, ContextCapture, Guide for photo acquisition, 2015)

After importing the photos into the program, selected control image point coordinates are either calculated from the GPS data or input into the program in the spatial reference system that the user selects (e.g. WGS84). Should no GPS data be available, or should the output need great geospatial precision, the user must take photos of some known geo-referenced points that exist in the scene and then match those in the photographs when creating the 3D model. At least three geo-referenced coordinate points are required in two images for the model to be geo-referenced. The next step is for the user to run the aerotriangulation in one of the dedicated modes, and within minutes a 3D model has been created. It is then a simple matter to isolate a surface terrain model (STM) from which

contour lines may be extracted – for use in other programs.

ContextCapture is also able to use LiDAR survey point cloud information to generate a 3D mesh which may be coloured with the point cloud RGB information in order to again generate an intelligent and scalable terrain model or 3D object model, as the case may be.

The technology is fully compatible with the use of unmanned drones and traditional aerial photography techniques. It is possible to plan predetermined drone flight paths using Apps such as DJI MAVICPRO DroneDeploy from one's cell phone. Figures 2 and 3 provide guidance on how these aerial photos should be taken, with regard to the extent of the overlapped regions required.

The simple formula below governs the spatial resolution of the photos captured using such aerial techniques:

$$R = \frac{Ls \times D}{f \times L}$$

$$P = 3 \times R$$

Where:

R = the spatial ground resolution of the photos (m/Px)

Ls = greater size of the sensor (mm)

D = distance from camera to the subject (m)

f = focal length of the camera (mm)

L = greater size of the photograph (Px)

P = the spatial positioning precision of the 3D mesh vertices.

LIMITATIONS

There are a few limitations that one must be aware of when using the ContextCapture system:

- A sufficient number of photos must be taken of an object.
- A constant light environment is required.
- Auto-rotation, resizing or cropping of the photos should not be allowed.
- A constant focal length during the photo acquisition is best.
- The software will not work properly if fish-eye lens camera photos are used.
- The software does not properly reconstruct transparent or shiny objects such as water or glass.
- Photos of the same item should not be taken from too dissimilar or too similar points of view.
- If one is trying to capture the underside of an object, special arrangements must be made for the background.
- The software requires that plain items (those with a uniform characteristic in them) require something with texture in them in order to mesh correctly in the 3D model.
- Optical stabilisation and flash light photography should be avoided.

APPLICATIONS

The following is a broad list of areas within the professional services context where the use of this technique could prove to be of great benefit:

- Topology/topographic site surveys
- Aerial photography
- On-site progress monitoring for large construction projects

- Hydraulic analysis of catchment areas for the determination of hydraulic flood levels and flow velocities. Once contours have been extracted, the familiar hydraulics program HEC-RAS (for example) is able to use the data to determine the required hydraulic information.
- Site inspections
- Routine roads and bridges monitoring
- Telecommunication and mast infrastructure surveys
- Municipal town planning
- Accident investigations
- Infrastructure maintenance programmes
- Brownfield site expansion works
- Rock mechanics and geological surveys
- Archaeology
- Facilities and asset management
- Bulk materials handling
- Ports and marine asset management
- Mining.

CONCLUSION

Depending on the required precision, purpose of the model, chosen acquisition



Figure 4 Example of a 3D model generated by ContextCapture

device, and the subject of the modelling, the method of survey can be completely different from project to project.

The ContextCapture technique described in this article requires some forethought by the user prior to going out into the field to capture the data. However, once this has been correctly done, the benefits in the use of the

technique are endless, and it will be exciting to see in how many other areas this technology will find a scope for application.

Further guidance on the limitations and application use of ContextCapture is available from the Bentley Products website (<https://www.bentley.com/en/products/brands/contextcapture>). □



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Dispute Boards –

Ethics in Today's World of DRBs¹ (article 5)



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INTRODUCTION

An introductory article on Dispute Board ethics appeared in the July 2017 edition of the *Civil Engineering*.²

It reminded the reader of a series of six articles on Dispute Boards (DBs) which appeared in previous editions of *Civil Engineering* and advised that the next series of articles on DBs would be aimed at specifics, dealing with pertinent aspects of DBs in more depth. It also advised that interspersed with these will be a series of articles on DB ethics penned by Jim Phillips PhD, Chair Dispute Review Board Foundation (DRBF) Ethics Committee. These articles were first published under the general heading of “Ethics in Today's World of DRBs” in the DRBF *Forum*³ and are republished by kind permission of the DRBF and the author Jim Phillips.

The article that follows is the fifth of these articles on DB ethics that we will be reproducing (the first four articles appeared in the August⁴ and September⁵ 2017 and March⁶ and May⁷ 2018 editions of *Civil Engineering*, respectively).

The July 2017 article stated the DRBF Canons of Ethics. Included furthermore in the article were practice guidelines and further discussion on how Board members are expected to conduct themselves, which were reproduced from Chapter 2.10 of the DRBF *Practices and Procedures Manual*. Accordingly, it serves as a handy reference guide when reading the articles on DB ethics.

At the end of the May 2018 article the following question was posed, which forms the basis of this fifth article by Dr Phillips:

“Assume the same facts as last time, but the parties want to replace a Board member, not because of a loss in confidence due to a conflict of interest, but because they do not like any of the DRB Recommendations to date on the project. What should the DRB do?”

WHAT SHOULD THE DB DO?⁸

(by Dr Jim Phillips, Chair of the DRBF Ethics Committee) (lightly edited by Anton van Langelaar)

In the last column, I discussed the question of how a DRB should respond if the contractor advises the DRB Chair that it would like a Board member to resign because it had lost confidence in that member's neutrality. The question for this column is how the Board should respond to a request from both parties for a member to resign because they do not like the Recommendations being issued by the DRB.

First of all, I am certain we all agree that there is a huge difference between these scenarios. It's one thing for a Board member to be challenged based on their neutrality; it is something else entirely for the parties to claim that a member should resign because of a disagreement or dissatisfaction on the merits with the DRB's Recommendations.

Canon 5 of the Foundation's Canon of Ethics may be the only Canon remotely related to this issue. This Canon provides in part that “... [r]eports shall be based solely on the provisions of the contract documents and the facts of the disputes”. If the parties are concerned about the DRB member's performance because he/she has gone beyond the four corners of the contract documents and the testimony at the hearing, then there may be an ethical implication.

For example, if the Board member in question insists on taking into account information not properly before the

Board, or insists on applying a “fairness” standard beyond the contract documents, then the DRB has a dilemma to address. However, if the parties are complaining about the member because they do not like his/her analysis or disagree with his/her reasoning regarding the content of DRB Recommendations, then ethical considerations may not apply.

However, as I wrote in the last column, the effectiveness of any DRB is predicated on the confidence and the trust the parties have in the process and in the members of the Board. If that trust or confidence is lost, then the Board's effectiveness will be compromised and this could very well lead to an ethical dilemma.

Another possibility is that if this DRB's Recommendations are not unanimous, and there are dissenting or separate Recommendations being issued, then a Board member's personal views on project disputes are on greater display. As many of you have said to me over the years, the DRB should make every effort to issue unanimous Recommendations. A split Recommendation can alleviate dissension among the Board, but it does not help the parties resolve disputes in a timely fashion.

Moreover, Section 3.7.3 of the Foundation's *Practices and Procedures Manual* cautions the DRB from disclosing the name of the dissenting Board member if there is a minority Recommendation issued. The concern is that if the dissenting Board member is identified, the party nominating him/her to the Board may be tempted to reject the Recommendation. This raises the process of Board selection which is beyond the scope of this discussion, but one I will return to in a future column.

The issue of the parties asking a Board member to resign is a complicated one. If both parties do not like the member's

approach or analysis of the disputes being heard by the DRB, this type of request may not rise to the level of an ethical issue. However, if the parties have lost their overall confidence in the Board member's ability to serve, this is more serious. In either case, the Chair, in my opinion, should convene the Board and lead a discussion of what is in the best interests of the parties and the project. If the Board member recognises that he/she is hurting the DRB process, he/she may consider offering his/her resignation.

At the very least, the Chair should treat the request seriously, and send the parties the message that their concerns are being heard, evaluated and considered. Often parties will complain and vent about individual Board Recommendations or opinions, and then move on to the next issue or project challenge. However, if they insist on a member's resignation, it deserves the DRB's full and immediate attention.

ETHICS: NEXT CHALLENGE

Assume you are the Chair of a DRB that has been operating on a project for quite some time. You are chairing a formal hearing of a dispute brought to the Board by the contractor for a Recommendation. The Rules of Procedure by which the hearings are conducted, and to which both parties have agreed, provide that no dispute can be heard without first being briefed in position papers and responded to by the other party. Assume that in the middle of the hearing, the owner alleges that there is a dispute being introduced for the first time at the hearing for which there has been no briefing in the position papers. ■

NOTES

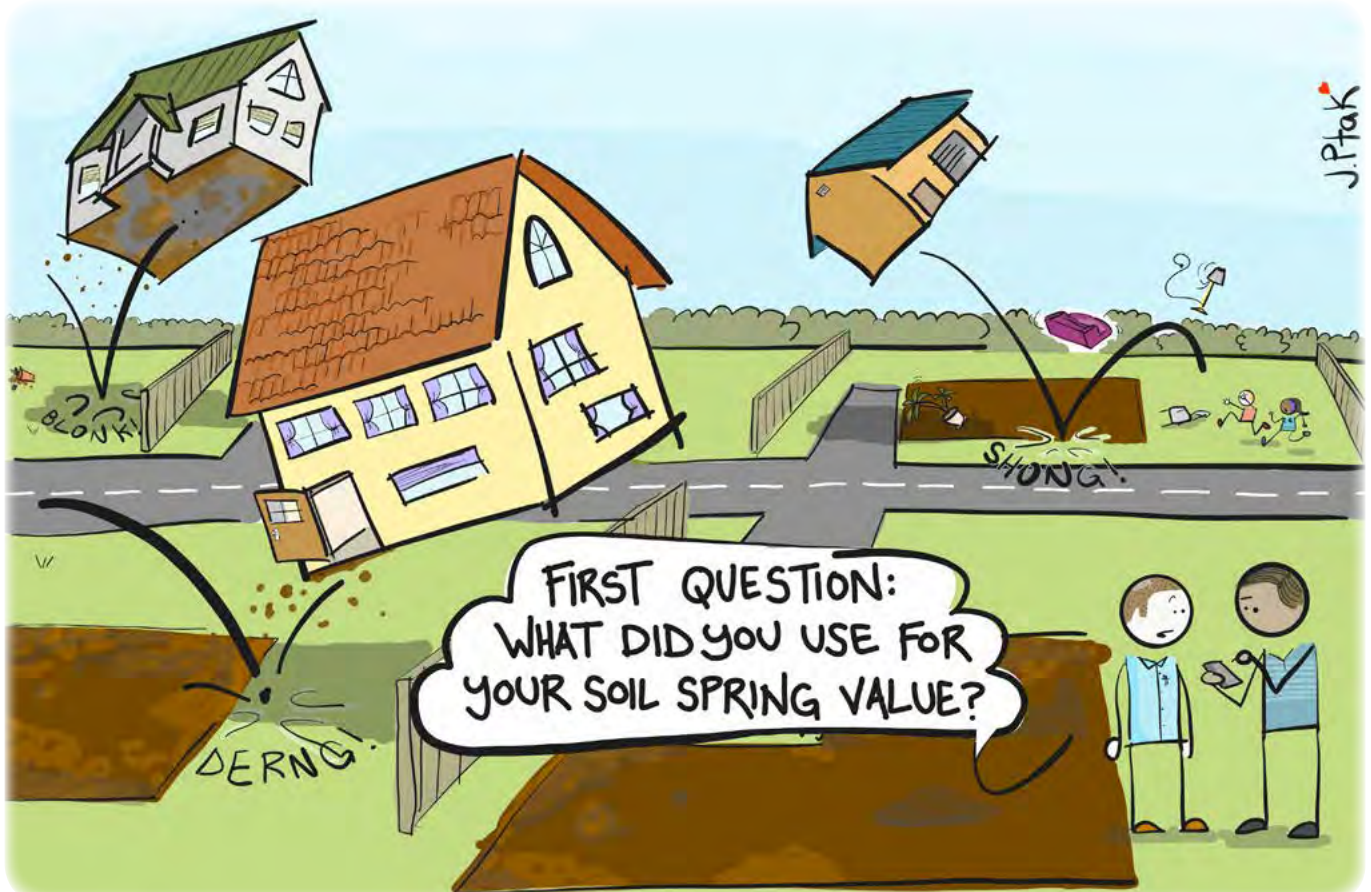
- 1 Dispute Review Board – gives a non-binding recommendation.
- 2 Van Langelaar, A 2017. Dispute Boards – Ethics. *Civil Engineering*, 25(6): 67–70.
- 3 The DRBF *Forum* is a quarterly publication of the DRBF.

- 4 Van Langelaar, A 2017. Dispute Boards – Ethics in Today's World of DRBs. *Civil Engineering*, 25(7): 52–53.
- 5 Van Langelaar, A 2017. Dispute Boards – Ethics in Today's World of DRBs (article 2). *Civil Engineering*, 25(8): 54–55.
- 6 Van Langelaar, A 2018. Dispute Boards – Ethics in Today's World of DRBs (article 3). *Civil Engineering*, 26(2): 66–67.
- 7 Van Langelaar, A 2018. Dispute Boards – Ethics in Today's World of DRBs (article 4). *Civil Engineering*, 26(4): 63–64.
- 8 First published in the DRBF *Forum*, Volume 15, Issue 2 February May 2011.

The DRBF is a non-profit organisation formed in 1996 and is dedicated to promoting the avoidance and resolution of disputes worldwide using the unique and proven Dispute Board (DB) method. The DRBF objectives include communication, education and training, and it has over 700 members in 80 countries.

Civillain by Jonah Ptak

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A lifetime of dedication rewarded spectacularly!

On 28 June this year Prof Kevin Wall, SAICE's 2001 President, received the prestigious NSTF Lifetime Award at a glittering gala dinner held in Johannesburg, attended by almost 700 guests and over 50 different organisations from the broader community, including representatives from various embassies.

The joyous event also happened to be the 20th anniversary celebration of this flagship project of the National Science and Technology Forum (NSTF), which annually recognises outstanding contributions to science, engineering, technology (SET) and innovation.

The NSTF is the most representative multi-stakeholder non-profit forum in South Africa promoting SET and innovation, and the NSTF-South32 Awards showcase the research and development capacity of our nation. These sought-after awards are the most important SET and innovation awards in South Africa, and are considered to be South Africa's 'Science Oscars'. It is an *honour* just to be nominated, an *outstanding achievement* to reach the finals, and an *exceptional milestone and celebration of excellence* to win one of these awards.

The awards were presented by the Minister of Science and Technology, Ms Mmamoloko Kubayi-Ngubane.

Prof Wall competed for the highest of the NSTF awards – the Lifetime Award – against a formidable list of finalists across the whole SET spectrum. As the first civil engineer to receive this award, his win therefore had the added benefit of highlighting civil engineering's value to society.

The focus of his long career (City of Cape Town, Ninham Shand, CSIR) has always been service delivery, through strategic and practical contributions (e.g. leading major urban development schemes, also systematising innovative self-help housing methods), innovative planning and design of infrastructure, institutional

reform, the crafting of policy documents, skills training, and evolving methods of support for the creation and nurturing of micro-enterprises in the infrastructure space. Over all these years Prof Wall raised awareness of key issues, particularly the importance of operation and maintenance, through the development of vehicles such as the National Infrastructure Maintenance Strategy. He led the team that developed the first National Water Services Infrastructure Asset Management Strategy. He also led the research for and co-authored the three editions of the SAICE Infrastructure Report Card for South Africa, which graded the condition of a broad range of infrastructure categories, and which caught the attention of influential government officials.

After retiring from the CSIR, he joined the Department of Construction Economics at the University of Pretoria as Extraordinary Professor. He still consults, particularly to National Treasury, and



serves on various boards where his trans-disciplinary and collaborative approach contributes to the development of sustainable policies.

We congratulate Prof Wall on this exceptional recognition of his work! He has indeed done our profession and SAICE proud! ■

Towards the end of last year, Prof Wall also received the SAICE Gold Medal, which is SAICE's highest accolade and which has been awarded only 22 times since its inception in the early 1950s.

Prof Kevin Wall holding his winning trophy, flanked by the Minister of Science and Technology, Ms Mmamoloko Kubayi-Ngubane (right) and Dr Philemon Mjwara, Director-General, Department of Science and Technology



New SAICE Fellows



DR MUSA S FURUMELE Pr Eng is a director at Gandlati Strategic Equity (Pty) Ltd and a civil engineer whose career traversed academia, government and consultancies. His experience cross-cuts a wide range of infrastructure sub-sectors, while his foremost interest is on facets of water security. He has further served on boards of several notable organisations and gained knowledge on governance and

financing of large-scale projects. He also has insights into contemporary thinking on managing technology, innovation and people in a systemic context, which was foundational to his doctorate. He is a Fellow of the South African Academy of Engineering.



MALANI PADAYACHEE-SAMAN Pr Eng is the first Indian and second Black registered professional female civil engineer in South Africa. During her 27-year involvement in the industry her focus has been mainly on the urban infrastructure environment and project management. For the last 21 years of this period she has occupied the title of

founder and current CEO of Malani Padayachee & Associates (Pty) Ltd. She actively promotes Labour Intensive Construction Methodologies (LICM), without compromising on quality or project timeline, and advocates long-term programme-driven approaches to address the high levels of unemployment that we are currently facing. She is an active participant in engineering-related topics, both from an entrepreneurial and a gender-diversity perspective, and her passion is to drive policy to fast-track transformation in the sector.



DR PHILIP STOTT Pr Eng studied civil engineering at Manchester University, obtaining BSc Hons and MSc degrees. He lectured in civil engineering at Ahmadu Bello University, Nigeria, and at the University of the Witwatersrand before becoming a consulting engineer. He was awarded a D Eng degree by the Central University of Technology (Free State).

He has published a number of papers in technical journals on structural engineering and soil mechanics, and received the Henry Adams Award from the Institution of Structural Engineers, as well as the J E Jennings Award from the South African Institution of Civil Engineering. □

Brian Downie elected as SAICE President-Elect for 2018



Brian Downie Pr Eng, SAICE's new President-Elect for 2018, who will be President in 2019

Due to unforeseen circumstances where SAICE's President-Elect for 2018 (and hence President for 2019) has stood down due to health reasons, and the President-Elect for 2019 has stood down for personal reasons, the SAICE Council was required to fill these positions urgently. Following due process, Brian Downie (who was a SAICE Vice-President and Council member some years ago) has been elected as the new President-Elect for 2018, and thus will be SAICE's President for 2019. The position of President-Elect and any resultant Vice-President vacancies will be attended to at the October Council meeting.

Brian is a previous chairman of the SAICE Durban Branch where he is still

an active member. He has a passion for engaging with young people on future technology and the challenges and opportunities that lie ahead. His theme for the year – **It's a New World** – encompasses the need to involve everyone in engineering to ensure a bright future for South Africa. He lectures students in 3D printing and in the technologies of the 21st century, and how these will impact on their careers and lives. And he practises what he preaches, experimenting with his own 3D printer and drone! He still provides consulting and mentoring services to the company where he worked for many years (Royal HaskoningDHV) and has recently co-authored two books on the history of civil engineering in South Africa. □

Obituary

Dr Oskar Steffen 1940–2018

SRK Consulting announces with great sadness the passing of Dr Oskar Steffen – one of the three founders of the now global firm of consulting engineers and scientists – on Wednesday 27 June in Johannesburg. He was 77 years old.

Oskar was born in Swaziland, where he spent his youth and completed his schooling. He left for Johannesburg in 1956 to study civil engineering at the University of the Witwatersrand (Wits), graduating with Bachelor's and Master's degrees in 1961 and 1963 respectively. He spent the next seven years working for Nchanga Consolidated Copper Mines in Zambia, initially in a geotechnical role focused mainly on pit slope stability and later transferring to production, where he moved successively through the roles of Shift Boss, Mine Captain, and Assistant Open Pit Manager Production and Planning, ending as Open Pit Manager.

Oskar left Nchanga in 1969 to take up an appointment as Senior Lecturer in Soil Mechanics and Foundation Engineering at Wits, where he worked with his mentor, Professor Jere Jennings. He remained at the university until late 1973; his research focused on rock slope stability, which later led to a PhD thesis dealing with methods of stability analysis for rock slopes. While at the university, he also consulted for civil and mining clients.

During 1973, Andy Robertson persuaded Oskar and Hendrik Kirsten to join him in a consulting partnership, and the firm Steffen, Robertson and Kirsten was formed in 1974. The new partners set out to build a firm where staff could reach their full potential within the business, rather than having to leave in search of new challenges; the concept was a series of practices under a unifying and supportive umbrella. They recognised



'Statesman', 'spiritual leader' and one of the three founding partners of SRK Consulting, Dr Oskar Steffen

that work must be interesting, preferably fun, and would need to be profitable to be sustainable.

Over the following decades, Oskar's recognition and profile as a top-drawer consultant went from strength to strength, significantly contributing to SRK becoming a premium brand in the industry. His consulting activities included open pit planning and design, rock and soil slope stability analysis and design for road and rail cuttings and open pit and strip mines, and general surface mining geotechnics, including tailings dam investigation and design. His innovation and discovery activities included developing frameworks for pit optimisation, strategic mine planning, and the application of probability techniques in geotechnical engineering, particularly regarding risk analysis of slope failure in open pit stability investigations.

Oskar served as President of the South African Institution of Mining

and Metallurgy from 1989 to 1990.

He was awarded the Brigadier Stokes Memorial Award in 1995 and the SAICE Geotechnical Gold Medal in 2001. The former award is given to individuals who make a unique contribution to the mining industry over many years and the latter to individuals who have made a significant contribution to furthering the art and science of geotechnical engineering in South Africa. Oskar was also awarded the Mining Journal's Lifetime Achievement Award in 2010 in recognition of his technical contribution to the international mining industry.

Oskar was very much the 'statesman' and 'spiritual leader' in the new practice, and his personal values had an outsize influence on the culture that evolved. He firmly believed that ownership opportunities for strong contributors were essential in securing their long-term commitment to the business, leading to increasingly broad-based ownership in SRK. His strategic approach also promoted SRK's expansion into a wide range of engineering and scientific disciplines.

Today, the company is a global group of practices, driven and owned by the kind of professionals who leaders like Steffen encouraged and inspired.

Vis Reddy

Managing Director
SRK Consulting SA
vreddy@srk.co.za

SAICE's Geotechnical Engineering Division hereby offers its heartfelt condolences to SRK Consulting and Dr Oskar Steffen's family. Dr Steffen, who was a Senior Fellow of SAICE, will indeed be fondly remembered by the many SAICE members who were inspired by him at some stage in their careers.

SAICE Training Calendar 2018

| Course Name | Course Dates | Location | CPD Accreditation Number | Course Presenter | Contact |
|---|----------------------|----------------|--|--|-------------------------|
| General Conditions of Contract for Construction Works (Simplified Form): First Edition 2018 – SGCC 2018 | 3 September 2018 | Kimberley | SAICEcon18/02270/21 Credits: 1 | Benti Czanik | cheryl-lee@saice.org.za |
| | 10 September 2018 | Cape Town | | | |
| | 27 September 2018 | Port Elizabeth | | | |
| | 9 October 2018 | Bloemfontein | | | |
| | 30 October 2018 | Midrand | | | |
| | 13 November 2018 | Pretoria | | | |
| General Conditions of Subcontract for Construction Works: First Edition 2018 – GCSC 2018 | 7 September 2018 | Midrand | SAICEcon18/02254/21 Credits: 1 | Benti Czanik | dawn@saice.org.za |
| | 14 September 2018 | Pretoria | | | |
| | 15 November 2018 | Nelspruit | | | |
| GCC 2015 – 3rd Edition | 20–21 September 2018 | Midrand | SAICEcon16/01869/19 Credits: 2 | Benti Czanik | cheryl-lee@saice.org.za |
| GCC 2015 and GCC 2010 Differences | 19 November 2018 | Durban | SAICEcon16/01890/19 Credits: 1 | Benti Czanik | dawn@saice.org.za |
| Project Management of Construction Projects | 18–19 October 2018 | George | SAICEcon18/02375/21 Credits: 2 | Neville Gurry | cheryl-lee@saice.org.za |
| | 25–26 October 2018 | Midrand | | | |
| Structural Steel Design to SANS 10162-1-2005 | 25 September 2018 | Midrand | SAICEstr15/01726/18 Credits: 1 | Greg Parrott | cheryl-lee@saice.org.za |
| Reinforced Concrete Design to SANS 10100-1-2000 | 26 September 2018 | Midrand | SAICEstr15/01727/18 Credits: 1 | Greg Parrott | cheryl-lee@saice.org.za |
| Practical Geometric Design | 5–9 November 2018 | Midrand | SAICEtr16/01954/19 Credits: 5 | Tom McKune | dawn@saice.org.za |
| Business Finances for Built Environment Professionals | 6–7 September 2018 | Cape Town | SAICEfin18/02297/21 Credits: 2 | Wolf Weidemann | dawn@saice.org.za |
| | 8–9 November 2018 | Midrand | | | |
| Handling Projects in a Consulting Engineer's Practice | 5–6 November 2018 | Midrand | SAICEproj18/02298/21 Credits: 2 | Wolf Weidemann | dawn@saice.org.za |
| Leadership and Management Principles and Practice in Engineering | 7–8 November 2018 | Midrand | SAICEbus15/01784/18 Credits: 2 | David Ramsay | dawn@saice.org.za |
| Water Law of South Africa | 11–12 September 2018 | Cape Town | SAICEwat16/01955/19 Credits: 2 | Hubert Thompson | dawn@saice.org.za |
| The Legal Process dealing with Construction Disputes | 18–19 September 2018 | Bloemfontein | SAICEcon16/01956/19 Credits: 2 SACPCMP: 12 | Hubert Thompson | dawn@saice.org.za |
| | 13–14 November 2018 | Cape Town | | | |
| Earthmoving Equipment, Technology and Management for Civil Engineering and Infrastructure Projects | 24–26 October 2018 | Midrand | SAICEcon15/01840/18 Credits: 3 | Prof Zvi Borowitsh | dawn@saice.org.za |
| Legal Liability Occupational Health and Safety Act (OHSA) | 26 September 2018 | Bloemfontein | SAICEcon17/02038/20 Credits: 1 | Cecil Townsend Naude | dawn@saice.org.za |
| | 31 October 2018 | Polokwane | | | |
| Construction Regulations from a Legal Perspective | 27–28 September 2018 | Bloemfontein | SAICEcon17/02037/20 Credits: 2 | Cecil Townsend Naude | cheryl-lee@saice.org.za |
| | 1–2 November 2018 | Polokwane | | | |
| Legal Liability Mine Health and Safety Act (MHSA) Act 29 of 1996 | TBC | TBC | SAICEcon18/02359/21 Credits: 2 | Cecil Townsend Naude | dawn@saice.org.za |
| Principles and Practices of Facility Management for Engineers | 8–12 October 2018 | Midrand | SAICEbus17/02042/20 Credits: 2 | Wynand Dreyer Lwandiso Mgwetyana Shane Verster | dawn@saice.org.za |

SAICE / South African Road Federation (SARF)

| | | | | | |
|---------------------------------------|-------------------|-----------|----------------------------------|------------------------|---|
| Concrete Road Design and Construction | 26 September 2018 | Cape Town | SAICEtr15/01802/18 Credits: 1 | B Perrie, Dr P Strauss | sybul@sarf.org.za / tshidi@sarf.org.za |
| | 3 October 2018 | Midrand | | | |

SAICE / Computational Hydraulics Int (CHI)

| | | | | | |
|---|----------------------|--------------|-----------------------------------|---|--------------------------------------|
| Surface Water and Integrated 1D-2D Modelling with EPA SWMM5 and PCSWMM – 1 Day | 11 September 2018 | Cape Town | SAICEwat17/02197/20 Credits: 1 | Chris Brooker Onno Fortuin Robert Fortuin | Meghan Korman meghan@chiwater.com |
| | 25 October 2018 | Johannesburg | | | |
| Surface Water and Integrated 1D-2D Modelling with EPA SWMM5 and PCSWMM – 2 Days | 11–12 September 2018 | Cape Town | SAICEwat17/02198/20 Credits: 2 | Chris Brooker Onno Fortuin Robert Fortuin | Meghan Korman meghan@chiwater.com |
| | 23–24 October 2018 | Johannesburg | | | |
| Surface Water and Integrated 1D-2D Modelling with EPA SWMM5 and PCSWMM – 3 Days | 11–13 September 2018 | Cape Town | SAICEwat17/02199/20 Credits: 3 | Chris Brooker Onno Fortuin Robert Fortuin | Meghan Korman meghan@chiwater.com |
| | 23–25 October 2018 | Johannesburg | | | |

SAICE / Classic Seminars

| Course Name | Course Dates | Location | CPD Accreditation Number | Course Presenter | Contact |
|----------------------------------|---------------------|----------|------------------------------------|--|------------------------|
| Project Management Foundations | 15–17 October 2018 | Midrand | SAICEproj18/02374/21 Credits: 3 | Martin Bundred Eldridge Ntini Bianca Landsberg | admin@classic-sa.co.za |
| | 29–31 October 2018 | Durban | | | |
| Advanced Project Risk Management | 19–20 November 2018 | Midrand | SAICEproj18/02360/21 Credits: 2 | Martin Bundred | admin@classic-sa.co.za |
| | 22–23 November 2018 | Durban | | | |
| Earned Value Management | 8 November 2018 | Midrand | SAICEproj18/02259/21 Credits: 1 | Martin Bundred Philip Russell Eldridge Ntini | admin@classic-sa.co.za |
| | 12 November 2018 | Durban | | | |

Candidate Academy

| | | | | | |
|---|----------------------|-----------|-----------------------------------|---------------------------------|--------------------|
| Road to Registration for Candidate Engineers, Technologists and Technicians | 11 September 2018 | Midrand | CESA-861-05/2019 Credits: 1 | Dr Allyson Lawless | lizelle@ally.co.za |
| Road to Registration for Mature Candidates | 13 November 2018 | Durban | CESA-948-11/2019 Credits: 1 | Peter Coetzee Stewart Gibson | lizelle@ally.co.za |
| | 22 November 2018 | Midrand | | | |
| Pressure Pipeline and Pump Station Design and Specification – a Practical Overview | 17–18 September 2018 | Cape Town | CESA-872-05/2019 Credits: 2 | Dup van Renen | lizelle@ally.co.za |
| | 11–12 October 2018 | Durban | | | |
| Getting Acquainted with Road Construction and Maintenance | 29–30 November 2018 | Midrand | CESA-870-05/2019 Credits: 2 | Theuns Eloff | lizelle@ally.co.za |
| Getting Acquainted with Sewer Design | 12–13 September 2018 | Durban | CESA-871-05/2019 Credits: 2 | Peter Coetzee | lizelle@ally.co.za |
| | 27–28 September 2018 | Midrand | | | |
| | 19–20 November 2018 | Cape Town | | | |
| Getting Acquainted with General Conditions of Contract for Construction Works (GCC2015) | 17–18 September 2018 | Durban | CESA-873-05/2019 Credits: 2 | Theuns Eloff | lizelle@ally.co.za |
| | 15–16 October 2018 | Midrand | | | |
| Getting Acquainted with Urban Water Management | 19–20 September 2018 | Durban | SAICEwat18/02344/21 Credits: 2 | Peter Coetzee | lizelle@ally.co.za |
| | 24–25 October 2018 | Midrand | | | |

In-house courses are available. To arrange, please contact:
Cheryl-Lee Williams (cheryl-lee@saice.org.za) or Dawn Hermanus (dawn@saice.org.za) on 011 805 5947.
For Candidate Academy in-house courses, please contact:
Dawn Hermanus (dawn@saice.org.za) on 011 805 5947 or Lizelle du Preez (lizelle@ally.co.za) on 011 476 4100.

NOTICE TO SAICE CORPORATE MEMBERS

Further urgent revision to the SAICE Constitution

We thank you for your assistance earlier this year in finalising the revised SAICE Constitution (the notices in the October and November 2017 editions of our magazine, *Civil Engineering*, refer, followed by the ballot earlier this year). The revisions were overwhelmingly positively voted on, and were thus accepted. The revised Bylaws were also accepted by the SAICE Council at its meeting on 24 April 2018, after a number of minor amendments were made to the Bylaws to comply with the requirements to be registered as a non-profit organisation (NPO). The documentation was subsequently submitted to the Department of Social Development (the department responsible for NPO registration). They replied to SAICE that our documents were compliant, except that it did not state that SAICE is a “Body Corporate”, as defined in the model constitution that they had provided.

SAICE then resubmitted the documentation to the Department of Social Development as a Draft Constitution, with the following Body Corporate clause included, to see if it would be acceptable to them (they have already confirmed it is), in which case we would revise our Constitution accordingly:

- 1.16 The Institution shall exist in its own right, separately from its members; continue to exist even when its membership changes

and there are different office bearers; be able to own property and other possessions and be able to sue and be sued in its own name.

Registration as an NPO is necessary for SAICE to obtain a Level 2 B-BBEE scorecard, which would enable us to competitively offer courses and other services to our members and clients. The SAICE Executive Board has accepted the addition of Clause 1.16 and the change of numbering of the previous Clause 1.16 to Clause 1.17. Executive Board then asked Council to approve the minor revision by email rather than waiting for the October Council meeting, due to the urgency of the matter.

As electronic voting is allowed by the new Constitution, this notice serves to alert our Corporate Members that you should expect a digital ballot email in due course. We appeal to you to then please return your vote to us by the deadline given, so that we can finalise this matter. The Constitution may only be amended if the proposed amendment is approved by a two-thirds majority of those voting in a secret ballot of all Corporate Members in good standing, provided that a minimum of 5% of Corporate Members respond. □

For more information, please contact SAICE's Chief Operating Officer, Steven Kaplan, at steven@saice.org.za or +27 11 805 5947.



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