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*Safety in Numbers for Construction*

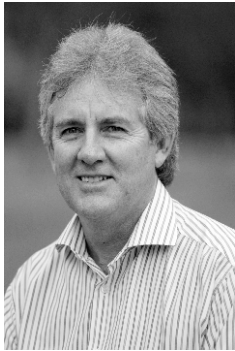
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Mike Deeks

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## *Mike Deeks*

**G**raduated with a bachelors degree in civil engineering from UCT in 1975. Employed by Cape Town City Engineer's Department from 1976 to 1981. From 1981 to the present employed by Murray & Roberts Group companies, M&R Gillis-Mason and, since 1997, Engineering Management Services. Responsibilities have included commercial and design co-ordination of major turnkey and other civil construction projects, proposals, estimating, commercial management, project controls, feasibility studies and procurement.

Service to SAICE has been as member of the Committee of the Witwatersrand Branch, Council and Executive Committee, the Professional Relations and International Relations Committees and as Chairman of the Membership Committee, Vice President for 2001 with the portfolio of Professional Development.

Vice-Chairman of the Civil Professional Advisory Committee of ECSA.

## Synopsis

South Africa has world class health and safety legislation and Construction Regulations, gazetted in 2003, which have been supported and endorsed by all constituencies in the industry. These regulations set obligations for all parties in construction projects the Owner, the Designer, the Principal Contractor and other Contractors - as well as requirements for periodic inspection of completed structures. However, the construction industry continues to be plagued by a series of failures, many of which have been widely reported in the media, and a poor record generally in terms of fatalities and maiming injuries.

These incidents and a recent “blitz” by the Department of Manpower indicate a low level of compliance with the regulations, with only 5% of sites being assessed as fully compliant. Enforcement of the regulations by the Department has also been largely absent, without evident prosecution of offenders, while up to date statistics on incidents are also not available.

School leavers, including possible new entrants into civil engineering, are presented with an attractive choice of other career fields to enter and are likely to perceive construction as a dangerous, dirty and uncaring employment sector. This impacts civil engineering as a career choice, at a time when South Africa has a real need for new top calibre men and women to follow civil engineering. The industry is faced with the prospects of a boom in construction of infrastructure and industrial projects at a time when its skilled resources are reduced to critical levels, and many of its civil engineering professionals are approaching retirement.

Where there has been a demonstrable commitment by owners, contractors and other role players to a policy of “zero harm”, much improved results are evident on their projects. What is needed to bring about real improvement, and thus improve the image of construction, is the adoption of a health and safety culture as well as the personal commitment by all members of the Institution.

## Samevatting

Suid-Afrika het wêreldklas gesondheids- en veiligheidswetgewing en konstruksieregulasies, wat in 2003 in die Staatskoerant geplaas is. Dit is deur al die rolspelers in die industrie gesteun en onderskryf. Hierdie regulasies plaas verpligtings op al die betrokkenes in konstruksieprojekte die eienaar, ontwerper, die hoofkontraakteur en ander kontraakteurs - sowel as vereistes vir die periodieke inspeksie van voltooide strukture. Die konstruksie-industrie word egter steeds geteister deur 'n reeks ineenstortings, waarvan talle deur die media gedek is. Verder bestaan daar oor die algemeen 'n swak rekord wat betref noodlottige en verminkende beserings.

Hierdie insidente en 'n onlangse 'blitz' deur die Departement van Mannekrag, toon 'n lae vlak van voldoening aan die regulasies. Slegs vyf persent van die terreine wat ondersoek is, het ten volle aan die vereistes voldoen. Afdwinging van die regulasies deur die Departement is grootliks afwesig. Daar is geen ooglopende vervolging van oortreders nie en onlangse statistiek oor insidente is ook nie beskikbaar nie.

Skoolverlaters, insluitende moontlike nuwe toetreders tot siviele ingenieurswese, word baie aantreklike keuses van ander beroepsvelde gebied. Hulle kan moontlik konstruksie as 'n gevaarlike, vuil en nie-sorgdraende werksektor ervaar. Dit het 'n impak op siviele ingenieurswese as 'n beroepskeuse op 'n tydstip dat Suid-Afrika 'n werklike behoefte aan nuwe hoë-gehalte manne en vroue het wat siviele ingenieurswese as beroep kan volg. Die industrie staan voor 'n moontlike ontploffing in die konstruksie van infrastruktuur en industriële projekte juis nou dat opgeleide bronne/beroepslui besig is om te verminder tot kritiese vlakke en baie siviele ingenieurs in die bedryf aftrede nader.

Waar daar 'n sigbare verbintenis tot 'n beleid van 'zero beserings' deur eienaars, kontraakteurs en ander rolspelers was, was verbeterde resultate op die projekte voor die hand liggend. Wat nodig is om werklike vordering teweeg te bring en so die beeld van konstruksie 'n hupstoot te gee, is die aanneming van 'n gesondheids- en veiligheidskultuur, asook 'n persoonlike verbintenis deur al die lede van die Instituut.

## Introduction

Indications are that South Africa stands at the threshold of a boom in construction activity, the like of which has not been seen for two decades. This next wave of activity, however, will take place against the backdrop of low numbers of graduating civil engineers, a significant aging proportion of the Institution's members approaching retirement age and a gap in upper-middle level management in the industry, and a contracting industry whose skilled work force stands well below optimal levels. Among the drivers of this boom, the following have been identified and widely publicised in the media:

- Government's R165bn investment in infrastructure power (both fossil-fuelled and nuclear) and ports
- The R15 bn Expanded Public works Programme (EPWP)
- R2,5 bn cement plant capacity expansions
- R12 bn Gautrain rapid rail project
- R5 bn brewery expansions
- Stadia and infrastructure upgrades for Soccer World Cup 2010
- Regional and local mining and minerals mega-projects

Promising and talented South African school leavers, faced with an unprecedented choice of careers, are regularly made aware that the construction industry and, by extension, civil engineering presents a career which, while it may be exciting, challenging, fulfilling and one for which there is currently great demand, nevertheless carries the stigma of being dangerous and often uncaring for the health and safety of its workers and society at large. For its semi-skilled and unskilled labour force, it is often the employment sector of last resort - due to factors which include its migratory nature, susceptibility to market volatility, physical harshness, relatively low wage rates and also its poor safety record. And so it is that civil engineers have been graduating from South African universities at the rate of only around 200 per year for the past several years which, when read in conjunction with statistics for emigration and career switching, is far from adequate to keep pace with current industry activity in our developing economy, let alone for the anticipated growth in the industry.

What are needed to counteract the "breaking wave" of senior civil engineering professionals currently nearing retirement are large numbers of educated and trained civil engineering entrants - engineers, technologists and technicians, in balanced proportions and with an appropriate demographic representation. These must be suitably mentored and developed after graduation, not only in the purely technical knowledge areas of civil engineering but in the societal and environmental demands of our profession in this new era. As Pepi Selinga has commented, however, the industry is failing to attract and retain an adequate cadre of professional competence.

## Construction's Health & Safety Reputation

Since the earliest times, construction has been recognized as being a dangerous occupation from the point of health and safety and this perception continues to prevail.

Just over a hundred years ago the French abandoned their attempts under Ferdinand de Lesseps to cut a route through the Isthmus of Panama, due in large part to the awful effect that yellow fever and malaria had on its workers, with probably tens of thousands dying (although no comprehensive records were kept) before the link with transmission by mosquitoes was established. It was only after this discovery, in fact, that America was able to take over the work and successfully complete the enormous undertaking.

Construction of the 1800 km long Tanzania - Zambia railway in the early 1970s, designed and managed by the Chinese and employing largely unskilled imported labour, has been credited with introducing previously alien strains of malaria to the subcontinent, which wreaked havoc among the local population.

Construction in South Africa accounts for an unacceptably high incidence of fatalities and work-place injuries, many of which have received recent and deserved prominence in the media and in ministerial statements of condemnation. The industry has the dubious reputation as the third worst industry (after mining and transport) in terms of fatalities, with 236 deaths recorded on site in 1995 (the year for which the latest health and safety

statistics are available), according to the Compensation Commissioner's 2000 report. This statistic equates to more than one fatality per working day.

The Minister of Public Works had this to say in her opening address to the Council for the Built Environment's workshop in November 2004:

"It is a known fact that the quality of work by some of our built environment professionals is deteriorating. It is a very sad day when lives are lost because our professionals compromise on their designs to cut costs. Built environment professionals need to start taking responsibility for their work in order for us to ensure that the recent collapse of bridges and buildings like the Brooklyn Mall and centurion Shopping Mall does not happen again. I urge every single built environment professional in South Africa to start giving health and safety in the construction sector the priority it deserves."

Construction disasters that have been widely reported include the Injaka Bridge collapse in 1998 in which 14 people were killed, Neptune Interchange bridge collapse in November 2003 in which 2 workers were killed, the Cleveland bridge collapse in June 2004 in which 11 workers were injured, the death of young Korabo Gwala who was swept away after he fell into an uncovered manhole in Dube in February 2004 on a section of the network undergoing maintenance, and various spectacular structural failures in Tshwane's shopping malls.

Harry Seftel, South Africa's much loved and revered retired Professor of Medicine, has publicly credited South Africa's civil engineers with having saved more lives, through the provision of safe potable water and sanitation, than all the country's medical doctors. This is a record we should all be justifiably proud of, while at the same time recognizing the enormous challenges that still lie ahead.

To quote Brian Bruce, SAICE Past President and more recently Chairperson of the Construction Industry Development Board (CIDB), from his paper to the CIB International Conference in 2003, "Although great improvements have been recorded in basic education and primary health care since 1994

under leadership of our new democratic government, many South Africans still have inadequate access to even the most basic of services, including potable water, sanitation, housing,.....transportation...". This is where members of the Institution have a huge role to play.

This role was further underscored by Pepi Silinga in his address as CIDB Deputy Chairperson to SAICE's Centenary Congress in 2003 when he said, "It is because of the hundred years of SAICE and the preceding engineering endeavour that today South Africa has the potential to meet the challenges of poverty, disease and an inequitably distributed built environment that defines the existence of millions of people who still lack access to nutrition, potable water, sanitation, transport and basic services. These aspirations underscore the role of construction and engineering as we move forward."

### *The CIDB*

The CIDB, constituted in 2001 as a public entity by the CIDB Act 38 of 2000, is mandated (inter alia) to provide strategic leadership, promote sustainable growth, and promote improved performance and best practice. The CIDB has more recently broadened its focus to include the impact of HIV/AIDS in the construction industry, in conjunction with other industry stakeholders, including employers. It has produced a specification for the promotion of HIV/AIDS awareness for incorporation in tenders and construction contracts, a process that will depend entirely for its success on the commitment of project clients, consultants and contractors. It has also begun to look at the performance of the industry from a safety perspective, recognizing that this constitutes a key aspect of its brief in addressing "improved performance and best practice". CIDB's contractor recognition scheme aims to promote "supply-side performance" in terms of quality, safety, health and the environment.

CIDB's 2004 Report on the SA Construction Industry carries the damning observation, "Despite the efforts of employer and employee associations, the industry lacks commitment to a culture that actively promotes safety, health and the environment." It further points



out that employers tend to view health and safety compliance as a cost in the system, while small contractors seldom have the resources to hold even basic safety equipment. It reinforces the fact that the costs of non-compliance are huge, including rework, lost time, damage to plant and equipment, disruption, loss of productivity and loss of skills to the economy.

## ECSA

In terms of the Engineering Profession Act 46 of 2000, the Engineering Council of South Africa (ECSA) is charged with the statutory duty, among others, of upholding public health and safety as regards engineering work. As such it binds registered professionals, including civil engineers, technologists and technicians, by a Code of Conduct. In its role as engineering education quality assessor, both for the local profession and also as a requirement for international recognition, ECSA sets standards for university undergraduate engineering programmes and, through regular accreditation visits, verifies their compliance with its prescribed norms.

ECSA's document PE-61 which deals with the prescribed outcomes for B Eng or B Sc (Eng) degree programmes and which is due for revision to reflect SAQA's latest requirements, sets the following exit level outcomes as regards health and safety:

### Exit level outcome 3: Engineering Design

**Learning outcome:** Demonstrate competence to perform creative, *procedural* and *non-procedural* design and synthesis of components, systems, engineering works, products or processes.

#### **Evidence of competence:**

The candidate executes an acceptable design process encompassing the following:

1. Identifies and formulates the design problem to satisfy user needs, applicable standards, codes of practice and legislation;
2. Plans and manages the design process: focuses on important issues, recognises and deals with constraints;
3. Acquires and evaluates the requisite knowledge, information and resources:

applies correct principles, evaluates and uses design tools;

4. Performs design tasks including analysis, quantitative modelling and optimisation;
5. Evaluates alternatives and preferred solution: exercises judgment, tests implementability and performs techno-economic analyses;
6. Assesses impacts and benefits of the design: social, legal, health, safety, and environmental;
7. Communicates the design logic and information.

### Exit level outcome 7: Impact of Engineering activity

**Learning outcome:** Demonstrate *critical awareness* of the impact of engineering activity on the social, industrial and physical environment.

#### **Associated Assessment Criteria:**

The candidate identifies and deals with an appropriate combination of issues in:

1. The impact of technology on society;
2. Occupational and public health and safety;
3. Impacts on the physical environment;
4. The personal, social, cultural values and requirements of those affected by engineering activity.

Unfortunately, the aspects of health and safety included in these exit level outcomes are not always accorded the significance in university programmes that are intended and deserved, so that early sensitisation around the civil engineering professional's individual role in workplace health and safety does not adequately take place. In fact it has been commented that only roughly a half of South African universities' engineering programmes cover construction health and safety to any real extent. To compound matters, these and other so-called "soft" aspects of our professional development are often evidently not properly tested when candidates present for their professional peer review prior to being accepted for registration. And so the lack of real appreciation among professionals is propagated further.

## *SACPCMP*

The South African Council for the Project and Construction Management Professions (SACPCMP), instituted in terms of the PCMP Act, 48 of 2000, holds that one of the expected benefits of the new professional registration of Construction Project Managers and Construction Managers is that professionals registered in these categories will be “less likely to take unacceptable risks that affect the environment, lower quality and affect the safety of workers”. It remains to be seen if the Council's optimism is well founded once the number of persons currently being registered with SACPCMP reaches significant levels. The above statement also poses the question why civil engineers, technologists and technicians might allegedly be prepared to compromise their professional conduct in taking such risks, while a professional construction manager would not!

## *EPWP*

Government, as part of its 10 Year Review, has committed itself to the Expanded Public Works Programme (EPWP), a “comprehensive inter-governmental, people-centred programme” which aims to reduce unemployment and poverty through job creation. This is intended to be achieved through the use of large scale labour-intensive construction methods in delivering civil engineering infrastructure rural and municipal roads, stormwater drainage, community water supply and sanitation, and maintenance of state buildings - with a budgeted value of R15 billion, in rural and urban environments.

The programme is expected to introduce a large number of first time workers to the construction industry and to provide them with tradable skills for future employment or entrepreneurship in the industry. On several current projects learner contractors are being developed through the learnership programmes of the Construction Education and Training Authority (CETA). However, training and development of these new entrants also need to expose them from the outset to the principles of workplace health and safety and to industry best practices in general.

## *The Construction Regulations*

The Construction Regulations promulgated by the Minister of Labour in July 2003 in terms of the Occupational Health and Safety Act, No 85 of 1993, impose clear obligations on all parties to a construction contract and owners of an asset, namely the Client, the Client's Agent, the Designer, the Principal Contractor, the Contractor, and the owner of a structure.

These obligations include, for the Client, that it shall:

- prepare a “health and safety specification” for the construction work and provide this to any Principal Contractor bidding for, or appointed to perform, the construction work;
- promptly provide the Principal Contractor with any information which might affect the health and safety of any person at work;
- appoint the Principal Contractor in writing;
- ensure that tendering Principal Contractors have made provision for the cost of health and safety measures and be reasonably satisfied, before appointing the Principal Contractor, that it has the necessary competencies and resources to carry out its work safely;
- take reasonable steps, including periodic audits (at least monthly), to ensure that a Principal Contractor's health and safety plan is implemented and maintained;
- Stop any Contractor from executing work which is not in accordance with the Principal Contractor's health and safety plan or which poses a threat to health and safety.

Personal experience indicates that a large number of clients remain ignorant of their legal obligations, evident in their issuing requests for tenders which do not include the mandatory health and safety specifications, the awarding of contracts to contractors who do not possess the necessary competencies and resources to carry out the work safely, and their failure to carry out periodic health and safety audits. Completed structures have to be inspected every six months for the first two years and annually thereafter, and records of inspections have to be kept.

The Client may appoint an Agent in writing to act as its representative, in which event the Client's responsibilities in terms of the Regulations apply to the Agent, as far as

reasonably practicable. However, the Client has the responsibility to ensure that its Agent possesses the requisite competencies and resources to perform its duties in terms of the Regulations. This can be assumed to include the requirement for professional registration in terms of the relevant built environment professions acts.

The Designer has obligations to:

- make available to the Client, before issue of a tender enquiry, all relevant information concerning the design of a structure which may affect its pricing;
- inform the Contractor in writing of any known or anticipated hazards relating to the construction work and of all relevant information for its safe execution;
- provide written reports to the Contractor on geotechnical information, loading of the structure, and methods and sequence of construction;
- carry out sufficient site inspections to ensure compliance with the design and keep a record of inspections on site;
- stop work which is not in accordance with the design;
- carry out a final inspection of the completed structure and issue a completion certificate to the Contractor prior to commissioning.

The Principal Contractor is obliged to provide the Provincial Director with prior written notice of any construction work which:

- includes demolition of a structure higher than 3 m, dismantling plant at a height greater than 3 m, or the use of explosives;
- exceeds 30 days' duration or involves more than 300 man-days, and includes excavations deeper than 1 m or work at heights exceeding 3 m.

The Principal Contractor also has to:

- Submit to the Client a suitable and comprehensive health and safety plan based on the Client's health and safety specification;
- provide any Contractor tendering or appointed to perform construction work with the relevant sections of the Client's health and safety specification;
- appoint every Contractor in writing for the performance of its part of the project and

only if it is reasonably satisfied that the Contractor possesses the necessary competencies and resources to perform the work safely;

- take reasonable steps, including periodic audits, to ensure implementation by Contractors of their health and safety plans;
- stop any Contractor from executing work which is not in accordance with the Principal Contractor's or Contractor's health and safety plan or which poses a threat to health and safety;
- maintain and hand over to the Client upon completion of construction a health and safety file including all documentation required in terms of the Act and its Construction Regulations; records of all drawings, designs and materials used; updated list of all its Contractors with details of work carried out by them and the contracts entered into with them.

A Contractor carries the above obligations of the Principal Contractor where it appoints another contractor to carry out work. In other respects as well, it carries most of the obligations of the Principal Contractor and is obliged to co-operate with the Principal Contractor and keep it informed on matters of health and safety as far as is necessary to ensure compliance with the Act.

In terms of the Regulations, the Contractor also has clear obligations in terms of:

- appointment of competent employees as its construction supervisor or supervisors and construction safety officer;
- performing a risk assessment, including this in its health and safety plan, training workers accordingly in health and safety, and inducting all visitors on site hazards;
- housekeeping, including storage, removal and disposal of material and site access;
- facilities for workers, including showers, toilets, changerooms and accommodation.

As the CIDB's 2004 status report points out, significant challenges are presented to the industry in complying with these regulations, including the cost of compliance, and the resources required to manage, design and implement in accordance with both their letter and intent.



What is evident is that the Construction Regulations are largely not being enforced by the Department of Labour, particularly not among smaller and emerging contractors. Where incidents are investigated, these investigations at worst result in suspension notices which are lifted after a short time, but not prosecutions leading to imprisonment. Unfortunately, offenders in the industry are unlikely to reform until such time as they see evidence of stiff sentences for the guilty.

## *Towards a Culture of Health and Safety*

ILO Director-General, Juan Somavia has the following views on the need for a safety culture: "A safety culture must be nurtured through partnership and dialogue - governments, employers and workers within a framework of rights, responsibilities and duties, finding common ground, creating safe and healthy workplaces. I strongly believe that this is one of the most fertile areas for reaching consensus in the world of work."

Many responsible employers and contractors have committed themselves to a policy of "zero harm" in the workplace. Typically such a policy commits the organization to principles such as:

- all injuries and environmental incidents are preventable;
- the safety of employees and the prevention and minimisation of any impact on the environment is a non-negotiable value;
- leaders at all levels in the organisation are role models in the management of safety and environmental matters;
- "at-risk" behaviours are not acceptable and will be addressed when observed;
- no one ever walks past an unsafe act or condition, but fixes it or stops it;
- excellent health, safety and environmental performance is regarded as good business practice

On projects where owner and contractors are unequivocally committed to such principles, the results are immediately self-evident and the quantifiable bottom line benefit cannot be denied. By way of example, the Mozal

Aluminium Smelter and its subsequent expansion, implemented in Mozambique - a country ravaged by more than two decades of civil war, where malaria and other diseases were rife, with virtually no previously existing infrastructure, and where many of the local work-seekers trained and employed for a range of construction disciplines had never before been in formal employment - enjoyed remarkable successes in health and safety. These successes were largely attributable to the commitment by the project's owners not only to workplace health and safety, but to the environment, training and development of local labour and to the upliftment generally of the local community.

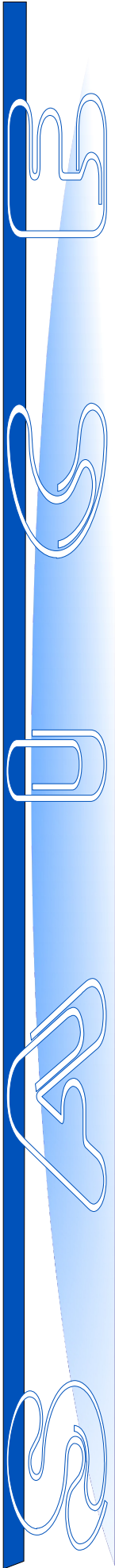
On the Mozal projects, a lost time injury frequency rate of only 1 per million hours worked was achieved, trending to a LTIFR as low as 0,36 in the last 12 months of the project. This compares very favourably with the SA construction LTIFR of approximately 10 and USA norms of around xx.

Sharon Beder, in her article "Your ethical obligations go further than you think", writes, "Clearly the new engineer, the ethical engineer, takes full responsibility not only for their own actions but also for what they know. They are prepared to act on their own judgement of what is best for the community, whether or not they are supported by their employers in this. This is where ethics go beyond legal obligations and why they are necessary despite the existence of a legal framework of protections. Engineers are not only entitled but also obliged to report their concerns to the appropriate authorities."

What are needed in South Africa are civil engineers, technologists and technicians for whom it would be unthinkable to walk past an unsafe situation, whether in their daily occupation or outside of it. Only then will we be able to claim to have made the transition to engaging health and safety on an emotional level, embracing it as a culture and with genuine commitment.

## *SACE's Role*

As the "home for all engaged in civil engineering", the Institution is ideally positioned to address the challenges of



resourcing for the industry - so that government's aspirations for job creation and poverty alleviation, and delivery of rural and urban infrastructure can be fulfilled - and of bringing about a change in health and safety performance. SAICE is able to do so as an impartial player, which does not represent the commercial or other interests of any single constituency in the industry, but carries the necessary credentials of its 7 000 strong membership and its international alliances. It should do so in conjunction with the relevant built environment professions councils (where it enjoys the status of a recognized voluntary association), other statutory bodies, employer federations, government departments, universities and its many other networks.

In this context, SAICE Past President Allyson Lawless has recently assisted CETA with identifying bottlenecks in the development of civil engineering professionals and proposing solutions for the industry. SAICE has been able to highlight problems and also facilitate access to opportunities for new professional entrants. Through the role of its members in undertaking university programme accreditation and peer reviews of candidate engineers, technologists and technicians, it is also well positioned to drive the adoption of a health and safety culture.

In his 2002 Presidential Address, Trueman Goba issued a challenge to members of SAICE to recognize the value of volunteerism and to play a personal role in shaping "a bright future for the profession and the construction industry". I believe that nowhere could this be better directed than in the area of health and safety.

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