



# Contents

MESSAGE FROM THE DIRECTOR

MESSAGE FROM THE OUTGOING DIRECTOR

INTRODUCTION

Objectives of the research unit

STAFFING

TEACHING ACTIVITIES AND POSTGRADUATE TRAINING

Postgraduate courses

Continuing professional development courses

CURRENT STUDENTS

Current PhD students

Current masters students

Graduated masters students (2015)

RESEARCH ACTIVITIES

Current research projects

IMPACT OF RESEARCH

PUBLICATIONS

Books

Refereed/peer reviewed journals

Proceedings of refereed international conferences

Proceedings of other conferences and symposia

Editor of conference proceedings

Papers in non-peer reviewed journals; un-refereed articles

AWARDS, PRIZES AND APPOINTMENTS

ORGANISATIONAL ARRANGEMENTS

HIGHLIGHTS

FUNDERS

COLLABORATIONS AND LINKAGES

# Message from the director



The Concrete Materials and Structural Integrity Research Unit (CoMSIRU) takes as a foundational philosophy the importance of developing high-level human resources for industry, academia and research. While we continuously explore fundamental and innovative research, we place significant value on the broader impact of our research. To this end, our research constantly evolves to focus on initiatives that will not only advance science and engineering, but will also significantly impact society, both locally and internationally.

CoMSIRU continues to maintain a strong local and international presence through participation in technical committees of professional bodies, conferences and workshops. Our International Conference on Concrete Repair, Rehabilitation and Retrofitting was held in Leipzig, Germany for the first time in 2015. The event was a great success and drew more than 300 participants. Thanks to Prof Frank Dehn for organising the event.

Prof Mark Alexander's term of office as president of the International Union of Laboratories and Experts in Construction Materials, Systems and Structures (RILEM) ended in 2015. I congratulate him on a successful presidency – as the first African president of this eminent body, his tenure has had a significant impact, not only for South Africa, but Africa on a whole. Prof Alexander also retired in 2015 and has now assumed a new role in the Faculty of Engineering & the Built Environment as a senior research scholar. He is one of only three retired professors to be offered this prestigious position, a clear reflection of his contribution to research and leadership at the University of Cape Town. I would like to thank Prof Alexander for his exemplary leadership.

More than 70% of our funding support is from our local industry partners. Despite the current economic challenges, these organisations continue to support our programme. This is deeply appreciated; thank you for valuing our contribution to human capital development and research.

We look forward to a productive year.

Prof Pilate Moyo  
Director



*Directors: Professor Pilate Moyo, Professor Mark Alexander and Associate Professor Hans Beushausen.*

## Message from outgoing director

It is my great pleasure to provide this brief message for the 2015 CoMSIRU Annual Report. I stepped down as director of CoMSIRU on retiring at the end of 2015. However, I know that it is in excellent hands under new director, Prof Pilate Moyo, assisted by his co-director A/Prof Hans Beushausen. I continue to be active in CoMSIRU by virtue of a three-year part-time research appointment in the EBE Faculty at UCT, and so will remain active in postgraduate supervision and research.

CoMSIRU was formally constituted in late 2010, when it received formal recognition from the University Research Committee at UCT. This was largely in response to growth in student numbers and research activities in previous years, under the then Concrete Research Group. However, it was also a recognition of the need to include the 'structural integrity' aspect of CoMSIRU's interests. Since then, CoMSIRU has continued to experience growth and productivity, with

between 20 and 35 full-time master's and doctoral students at any one time. In recent years, there has also been an increase in part-time MEng students, due to the introduction of strong postgraduate teaching programmes.

Universities in South Africa face many challenges at present and CoMSIRU doubtless will be involved, by virtue of being part of the university. I am confident that the unit will rise to the occasion and continue to do excellent work.





# Introduction

The Concrete Materials and Structural Integrity Research Unit (CoMSIRU) is an active research unit in the Department of Civil Engineering at the University of Cape Town. The unit's research is focused on durability of concrete structures, structural health monitoring, structural integrity assessment, and repair and rehabilitation strategies for concrete structures.

The guiding principle for CoMSIRU is developing high-level manpower for industry, research and academia, while engaging in innovative and impactful research. This is reflected in the strong integration between the unit's research, education and technology transfer activities. The unit maintains healthy and active links with industry through an advisory board, involvement in professional bodies and continuing professional development courses, as well as postgraduate training. CoMSIRU's well-established international links provide opportunities for collaborative research and benchmarking, which enables the research unit to continuously evolve and strengthen its niche research focus.

CoMSIRU's research enjoys high impact as measured by scholarly productivity, inclusion in local standards, local and international awards and the demand for its graduates in industry.

## Objectives of the research unit

- Expand and improve the pool of high-level skills in concrete materials and structural engineering, in South Africa;
- Influence the culture and practice of engineering design of concrete structures;
- Improve management of the infrastructure;
- Embed durability and sustainability in all aspects of concrete structural/civil engineering; and
- Promote structural health monitoring as a key tool for structural performance assessment.

# Staffing

## Honorary research associates



Prof Manu Santhanam



Dr Sifiso Nhleko



Mr Vernon Collis

## Postdoctoral research fellows



Dr Bjorn Hohlig



Dr Fulvio Busatta



Dr Ines Tchetgnia  
Ngassam

## Administration and finance



Mr Werner van der Ross



# Teaching activities and postgraduate training

CoMSIRU is integrally involved in two postgraduate programmes within the Department of Civil Engineering, namely the Structural Engineering and Materials (SEM) Programme and the Civil Infrastructure Management and Maintenance (CIMM) Programme. CIMM was developed by the research unit to offer a broad range of knowledge and skills including asset management, maintenance, and repair and rehabilitation of civil infrastructure in line with South African Government's Immovable Asset Management Act of 2007. Courses offered in these programmes are also open to industry for continuing professional development (CPD).

## Postgraduate courses

### ► Structural concrete properties and practice

The aims of the course are to provide structural engineers with fundamental and practical knowledge in concrete materials technology, to establish an understanding on modelling and designing concrete properties relevant to structural design and to create awareness of chemical and physical material characteristics of cementitious construction materials.

### ► Structural dynamics with applications

This course aims to introduce the concepts of structural dynamics and their applications in structural engineering. Specific applications considered include applications to seismic design of structures, blast and impact effects on structures and wind engineering.

### ► Bridge management and maintenance

This course aims to introduce the principles of bridge management and maintenance, with a focus on both highway and railway bridges. The course expands on the basic philosophies behind bridge management systems, and their structure and implementation.

### ► Durability and condition assessment of concrete structures

This advanced course aims to develop an understanding of durability aspects, service life design and non-destructive testing of concrete structures.



► **Structural performance assessment and monitoring**

This aims to introduce concepts of structural health monitoring of civil infrastructure through static and dynamic field measurements, as well as finite element modelling.

► **Repair and rehabilitation of concrete structures**

This course deals with the repair and rehabilitation of concrete structures. Strengthening systems and using fibre reinforced composites are also covered.

► **Advanced infrastructure management**

This course provides the principles and the practice of infrastructure management.

## Continuing professional development courses

► **Bridge design, analysis and construction**

This course covers various practical aspects of bridge design, analysis and construction, including bridge loads, conceptual design, structural design and construction technologies. Emphasis is on highway and railway bridges in reinforced and prestressed concrete.

► **Bridge management and maintenance**

The course provides guidance on the development and implementation of bridge management systems to facilitate effective maintenance and rehabilitation of bridge structures.

► **Condition assessment and repair/strengthening of reinforced concrete structures**

The purpose of the workshop is to provide participants with a fundamental and practical understanding of condition assessment of concrete structures, and concrete repair and strengthening methods.

► **Structural concrete properties and practice**

The underlying aims of the workshop are to highlight the importance of materials in the design and performance of concrete structures and to facilitate a good understanding of modern concrete technology, in order to promote economic and sustainable design of reinforced concrete structures.



# Current students

In 2015, CoMSIRU had 35 registered postgraduate students: three postdoctoral fellows, six doctoral and six master's students, as well as four MEng students. There were also 17 undergraduate dissertation students who worked in relevant areas of research for their final year projects. Graduation statistics show 11 MSc (Eng) in 2015. Details are given in the tables below.

## Current PhD students

Name	Supervisor	Title
R Gopinath	MG Alexander H Beushausen	A service life prediction model based on carbonation induced corrosion for South African conditions
M Kabani	P Moyo MG Alexander	Time dependent bridge network reliability assessment with health monitoring
P Bukenya	P Moyo H Beushausen	Dynamic characterisation of concrete dams using operational modal analysis
G Nganga	MG Alexander H Beushausen	The use of low clinker cementitious materials in concrete
P Arito	MG Alexander H Beushausen	The optimisation of mix design parameters and constituents to minimise cracking in patch repair mortars
M Kiliswa	MG Alexander H Beushausen	The influence of sewer environment parameters on the deterioration of concrete sewer pipes

## Current masters students

Name	Supervisor	Title
Y Amesu	P Moyo	Fatigue reliability of pre-stressed reinforced concrete box-girder railway bridges
N Makaring	P Moyo	Review of methods of analysing safety of large concrete arch dams
P Habimana	P Moyo	Behaviour of FRP-strengthened RC beams with concrete patch repairs under impact loading
C Chibulu	MG Alexander H Beushausen	Influence of cement extenders on early-age stress development and cracking potential of concrete overlays
S Ross	MG Alexander V Collis	Bamboo construction as a sustainable building technology from a structural and materials engineering perspective
S Balendra	H Beushausen	Performance approaches for concrete durability – developing a new framework for application
W Smith	H Beushausen	Reinforced Concrete Durability: The effective use of cover level with the application of surface treatments on reinforced concrete
C Ludwig	P Moyo	The influence of the structure-ballast rail interaction on the dynamic properties of railway bridges
B Nyoni	P Moyo	Numerical modelling of concrete hydropower dams exposed to ASR: long-term environmental effects of climate change
E Arito	H Beushausen	Performance requirements for patch repair mortar
P Jassa	H Beushausen	Alternative patch repair materials for rebar corrosion damage

## Graduated masters students (2015)

Name	Supervisor	Title
G Golden	MG Alexander H Beushausen	The effect of cyclic wetting and drying regimes on corrosion rate in rc structures
N Bester	MG Alexander H Beushausen	The influence of curing on restrained shrinkage cracking of bonded overlays
M Tsoana	H Beushausen	Repair and service life extension of reinforced concrete structures
N Makaring	P Moyo F Busatta	Review of methods of analysing safety of large concrete arch dams
O Alao	MG Alexander H Beushausen	Environmental classification for airborne chloride exposure
J Kamara	P Moyo	Risk-Based Bridge Management Strategies: Literature review and synthesis
E Okwori	P Moyo	An investigation into the application of impact echo techniques in non-destructive testing of RC piles/slender members
K Emma-Iwuoha	P Moyo	Developing a framework for embodied energy assessment of concrete rehabilitation options
O Baum	H Beushausen	The influence of varying binder content and W/B ratio on concrete carbonation
L Krause	MG Alexander	Durability assessment of the Gonubie Main Road continuously reinforced concrete pavement
F Potgieter	P Moyo	Vibration source ability of slender staircases

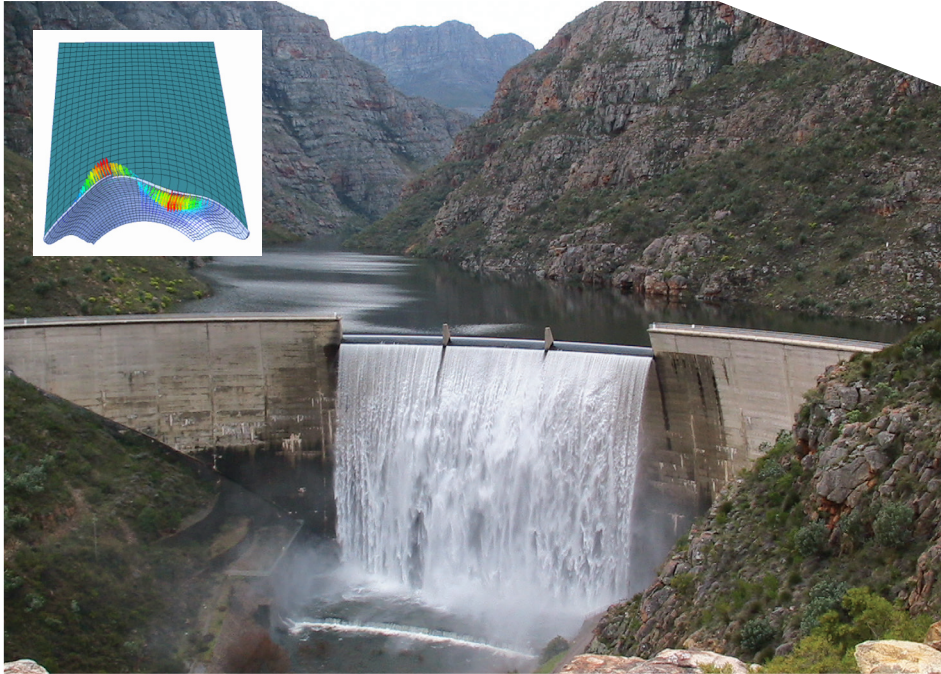
# Research activities

CoMSIRU's research work is focused on developing a deep understanding of both the short- and long-term behaviour of concrete and developing methodologies for producing durable and structurally sound concrete that minimises maintenance costs. Thus, there is a strong emphasis on understanding the deterioration mechanisms of concrete structures, development of technologies for assessment of concrete structures, as well as development of life extension of deteriorated concrete structures. This is achieved through two broad research thrusts; concrete materials and construction and structural integrity and monitoring.

CoMSIRU's research work is supported by state-of-the-art laboratories for concrete technology and structural concrete. The research unit integrates laboratory work, field measurements and computational modelling of materials and structures, which places the research unit in a good position to develop realistic and practical engineering solutions.

An important consideration in deterioration science and renewal engineering is sustainability of materials and construction. To this end, the research unit has embarked on developing knowledge and technologies that may be used by structural engineers to ensure their designs are sustainable.





## Current research projects

### ► Service life prediction models for reinforced concrete in the SA context

Service life prediction models exist at an international level, but it is essential that locality-specific models also be developed and calibrated, in view of the specificity of local environmental exposure conditions. Two such models are under development: one for chloride ingress into a wide variety of different concrete types, and the second a carbonation-corrosion model that couples CO<sub>2</sub> ingress with a tendency for subsequent corrosion.

### ► Low-clinker cements

It is imperative that modern concretes be formulated with as low a clinker factor as possible in the binder component, to minimise the carbon footprint of such concretes. This project considers practical ways of reducing the clinker factor of concrete using a combination of improved packing and reactivity of the fine filler materials, based largely on finely ground limestone and potentially reactive fly ash.

### ► **Durability and deterioration studies**

This research has been a consistent theme in CoMSIRU for many years. Currently, these studies relate to deterioration of concrete sewer pipes, for which PhD work is being done in order to better understand the deterioration processes in such sewers, and characterisation of the inter-tidal zone for chloride ingress into concrete. Work on deterioration of continuously reinforced concrete pavements has also been undertaken.

### ► **Sustainability and resource minimisation studies**

A PhD study was recently concluded that laid out a novel framework to assist structural concrete engineers to design for more sustainable concrete structures. Work is also on-going on understanding how to minimise resource usage of concrete materials, and a study on local bamboo in construction is being completed.

### ► **Fatigue reliability and long-term monitoring of railway bridges**

Developments in structural health monitoring of bridge structures are enabling the capture of information on as-built structural behaviour of these structures. Such information is useful for the assessment of the condition and reliability of bridges. This project is focused on the fatigue behaviour of concrete railway bridges. In particular, box-type sections will be considered. A monitoring system has been developed for the Olifants River Bridge, located in Vredendal.

### ► **Bridge management systems**

Visual inspection is the predominant bridge assessment technique employed by most current BMS. In South Africa, substantial visual inspection data has been collected in the last decade. However, these data have not been analysed to determine predominant deterioration mechanisms. This project seeks to gain deeper understanding of deterioration mechanisms in bridges located in the Western Cape.

### ► **Long-term performance of repaired reinforced concrete structures**

There is a dearth of information on the long-term performance of repaired reinforced concrete structures. Quite often, infrastructure owners have no idea about the effectiveness of repair and strengthening interventions and their long-term performance. In particular, the long-term behaviour of new cementitious grouts for structural repairs as well as fibre reinforced polymers (FRP) for structural strengthening is not well understood.



### ► Ambient vibration monitoring of concrete dams

Finite element modeling is a powerful tool for simulating structural system behaviour. In this body of work, updated finite element models will be used to predict the future behaviour of dams. Updating of the FEM models will be based on ambient vibration testing.

### ► Numerical modelling of the swelling effect of concrete structures

The chemical reactions involving aggregates, cement paste and water may lead to the swelling of concrete. Such volume changes lead to premature deterioration and, in some cases, structural failure. The problem of concrete swelling has been widely reported, especially in concrete dams. A number of numerical models have been proposed to simulate the swelling action and compute the structural response to this internal loading. This project is focussed on developing computational models for implementation in standard finite element analysis codes.

# Impact of research

The unit's research in concrete durability has been on-going for more than two decades and has led to a better understanding of the deterioration mechanisms of concrete. Test methods for the durability of concrete developed by CoMSIRU researchers have now been refined to a point where they are now within the SABS system for acceptance as national standards. Also, the revision of SANS10100-2 will incorporate research outputs in terms of concrete durability clauses.

CoMSIRU's research has instilled a comprehensive approach to condition assessment and strengthening of concrete structures, which may be noted by the input into national codes and standards, where research findings are being reflected. The unit's publications, specifically the series of monographs that are produced and regularly supplemented by new material. As far as scientific papers are concerned, the output of CoMSIRU is substantial, and the vast majority appear in internationally respected journals and conferences. New approaches from this research continue to be applied in major national construction projects.

## Publications

### Books

Alexander, M.G. Several chapters for a book on concrete durability, co-authored by S Mindess and A Bentur. To be published by T&F in 2016.

Alexander, M.G. *Design and durability of marine concrete structures*. New book proposed by Woodhead Publishers (Imprint of Elsevier). Edited by Professor Mark G. Alexander, Department of Civil Engineering, University of Cape Town, South Africa. Expected date of publication: 2016.

Chapter for the AAR2 update on Alkali Aggregate reactivity, edited by A Poole and I Sims, originally by Swamy.

*Design and durability of marine concrete structures*. New book proposed by Woodhead Publishers (Imprint of Elsevier). Edited by Professor Mark G. Alexander, Department of Civil Engineering, University of Cape Town, South Africa. Expected date of publication: end 2015.

Several chapters for a book on concrete durability, co-authored by S Mindess and A Bentur. To be published by T&F in 2015



## Refereed/peer reviewed journals

Thomas, M. and Alexander, M. Service life prediction and performance testing – current developments and practical applications. C&CR – Special 14th ICCI edition.

Kessy, J.G., Alexander, M.G. and Beushausen, H. Concrete Durability Standards: International trends and the South African context. *Journal of the South African Institution of Civil Engineering (SAICE)*, Vol 57 No 1, March 2015, pp. 47–58.

Moosa, F., Burger, H., Trauernicht, C., Blassopesc, G., Okwori, E., Nyoni, B. and Moyo, P. Concrete density estimation of Groote Schuur Hospital linear accelerator bunker walls using impact echo testing. *Physica Medica European Journal of Medical Physics* Vol 31: S17. September 2015. Doi: 10.1016/j.ejmp.2015.07.069.

Salvoldi, B., Beushausen, D. and Alexander, M.G. Oxygen permeability of concrete and its relation to carbonation. *Construction and Building Materials*, Vol. 85, 2015, pp. 30–37.

Beushausen, H. and Burmeister, N. The use of surface coatings to increase the service life of reinforced concrete structures for durability class XC. *Materials and Structures*, 2015, Vol. 48: 1243–1252.

Beushausen, H. and Dittmer, T. The influence of aggregate type on the strength and elastic modulus of high strength concrete. *Construction and Building Materials*, Vol. 74, 2015, pp. 132–139.

Otieno, M. and Alexander, M. Chloride conductivity testing of concrete – past and recent developments. *Journal of the South African Institution of Civil Engineering (SAICE)*, Vol. 57(4), 2015, pp. 55–64.

## Proceedings of refereed international conferences

Busatta, F. and Moyo, P. Structural health monitoring of the Olifants river viaduct. Proceedings of the 11th international conference organised by the International Heavy Haul Association (IHHA 2015), 21–24 June 2015. Perth, Australia.

Busatta, F. and Moyo, P. Vibration monitoring of a large scale heavy haul railway viaduct. Proceedings of the sixth international conference on experimental vibration analysis for civil engineering structures (EVACES' 15). 19-21 October 2015. Dubendorf, Switzerland: The Swiss Federal Laboratories for Material Science and Technology (Empa).

Alexander, M.G and Thomas, M. Service Life Prediction and Performance Testing – Current Developments and Practical Applications. Keynote Review paper, ICCI 2015, Beijing, Oct 2015.

Okwori, E., Moyo, P. and Matongo, K. An investigative study into the application of non-destructive testing techniques for integrity assessment of RC piles. At the fourth International Conference on Concrete Repair, Rehabilitation and Retrofitting. October 2015, Leipzig, Germany, pp 237-244, ISBN 978-1-315-67764-6.


Mbanjwa, T.D. and Moyo, P. Relationships between defects and inventory data of RC bridges and culverts in the Western Cape, South Africa. Proceedings of the fourth International Conference on Concrete Repair, Rehabilitation and Retrofitting. Dehn *et al.* (Eds), October 2015, Leipzig, Germany, Taylor and Francis Group, London, pp 911-918, ISBN 978-1-315-67764-6.

Arito, P.A., Beushausen, H. and Alexander, M.G. Towards improved cracking resistance in concrete patch repair mortars. Proceedings of the fourth International Conference on Concrete Repair, Rehabilitation and Retrofitting – Dehn *et al.* (Eds), October 2015, Leipzig, Germany, Taylor and Francis Group, London, Pp. 657-662.

Arito, P.A. and Beushausen, H. The effectiveness of corrosion inhibitors in reducing corrosion in chloride contaminated RC structures. Proceedings of the fourth International Conference on Concrete Repair, Rehabilitation and Retrofitting – Dehn *et al.* (Eds), October 2015, Leipzig, Germany, Taylor and Francis Group, London, Pp. 479-485.

Beushausen, H., Alexander, M.G., Wieland, M. and Linsel, S. Prescriptive versus performance-based design approaches for concrete durability. Concrete Institute Australia Conference, September 2015.

Kiliswa, M. W., Alexander, M. G. and Beushausen, H. Durability Design of Concrete Mixtures for Sewer Pipe Applications: A review of the life factor method. The fourth International Conference on Concrete Repair, Rehabilitation and Retrofitting. Leipzig. October 2015.



Kiliswa, M. W. and Alexander, M. G. Composition and microstructure of calcium aluminate cement systems subjected to biogenic sulphuric acid attack. The 14th International Congress on the Chemistry of Cement. Beijing. October 2015.

Beushausen, H. The influence of curing methods on concrete durability performance indicators. Invited Keynote, International Conference on the Regeneration and Conservation of Concrete Structures, Nagasaki, Japan, June 2015.

## **Proceedings of other conferences and symposia**

Alexander, M.G. and Nganga, G. Performance-based durability design and specification – background, and South African developments. KEYS Symposium, Dar Es Salaam, June 2015. 5 pp.

Moyo, P. Introduction to research and training activities on railway bridges and structures. University of Cape Town. SAHHA Technical Workshop, Johannesburg, South Africa, 8–9 October 2015.

Moyo, P. Dynamic testing and fatigue analysis of steel railway bridges. SAHHA Technical Workshop, Johannesburg, South Africa, 8–9 October 2015.

Busatta, F. Dynamic testing and monitoring of a heavy haul railway viaduct. SAHHA Technical Workshop, Johannesburg, South Africa, 8–9 October 2015.

Kabani, M. Reliability Analysis of Railway Bridges: Integrating FEM with structural health. SAHHA Technical Workshop, Johannesburg, South Africa, 8–9 October 2015.

## **Editor of conference proceedings**

Dehn, F., Beushausen, H., Alexander, M.G., and Moyo, P. Concrete repair, rehabilitation and retrofitting IV. Proceedings of the fourth International Conference on Concrete Repair, Rehabilitation and Retrofitting, October 2015, Leipzig, Germany, Taylor & Francis Group, London.

## Papers in non-peer reviewed journals; un-refereed articles

Muigai, R. and Alexander, M.G. Selecting concrete mix designs for improved sustainability. *CPI* 3/2015, pp. 56–59.

Mukadam, Z. and Alexander, M.G. The Durability Index Performance-based Approach in South Africa: A review. *Journal of the Concrete Institute of Australia*, 41 (3) September 2015, pp. 57–64.

## Awards, prizes and appointments

Prof Pilate Moyo was appointed Deputy Dean, Research and Postgraduate Studies in the Faculty of Engineering & the Built Environment.

Prof Mark Alexander was appointed as a senior research scholar in the Faculty of Engineering & the Built Environment. Mark's Presidency.

A/Prof Hans Beushausen received a new, and higher, NRF rating (C2).



# Organisational arrangements

CoMSIRU is overseen by its two directors, Prof Pilate Moyo and A/Prof Hans Beushausen. Prof Mark Alexander now plays role of senior advisor to CoMSIRU. Regular meetings are held by the three directors to discuss teaching, research, administration and budget issues. CoMSIRU is serviced administratively and financially by a research administrative finance officer, Mr Werner van der Ross.

Name	Company/Institution	E-mail
Pilate Moyo	UCT	pilate.moyo@uct.ac.za
Hans Beushausen	UCT	hans.beushausen@uct.ac.za
Mark Alexander	UCT	mark.alexander@uct.ac.za
Paul Adams	SIKA	adams.paul@za.sika.com
Eduardo Auger	PPC	eduardo.auger@ppc.co.za
Yunus Ballim	WITS	yunus.ballim@wits.ac.za
Chris Botha	Aveng Grinaker-LTA	Chris.botha@avenggroup.com
Billy Boshoff	SUN	bboshoff@sun.ac.za
Vernon Collis	Collis and Associates	vernoncollis@mweb.co.za
Steve Crosswell	PPC	scrosswell@ppc.co.za
Mike McDonald	Afrisam	mike.mcdonald@za.afrisam.com
Enzo Menegaldo	Haw and Inglis	emenegaldo@haw-inglis.co.za
Josiah Mpofu	Transnet	Josiah.mpofu@transnet.net
Sifiso Nhleko	National Nuclear Regulator	SNhleko@nnr.co.za
Wandile Nomquphu	Water Research Commission	wandilen@wrc.org.za
Chris Oosthuizen	Department of Water Affairs	coosthuizenc@gmail.com
Mike Otieno	WITS	mike.otieno@wits.ac.za
Bryan Perrie	TCI	bryanp@theconcreteinstitute.org.za
Manu Santhanam	Indian Institute of Technology, Madras	manusanthanam@gmail.com

# Highlights

## Workshop on research priorities in cement and concrete in South Africa

A workshop on research priorities in cement and concrete was held on 26 August 2015 at the University of Johannesburg, convened by Prof Mark Alexander. The aim was to allow researchers in cement and concrete to communicate their work to the broader industry, and for those in industry to share their research concerns with the researchers. The main outcome of the workshop was a research output – a topic matrix, which matched research activities with industry needs. A noteworthy alignment between industry's needs and current research topics was apparent, although there were obvious research gaps. Details of the workshop may be obtained from Prof Alexander, or from the CoMSIRU Website at: [www.CoMSIRU.uct.ac.za](http://www.CoMSIRU.uct.ac.za).





## ICCRRR 2015

The fourth International Conference on Concrete Repair, Rehabilitation and Retrofitting took place in Leipzig, Germany in October 2015. This was the first time the conference was held outside South Africa, a worthwhile change to reflect the unit's collaboration with the Construction Materials Section at Leipzig University.

## Funders



# Collaborations and linkages

---



**water & sanitation**

Department:  
Water and Sanitation  
REPUBLIC OF SOUTH AFRICA



**NATIONAL NUCLEAR REGULATOR**

*For the protection of persons, property and the environment against nuclear damage.*



**UNIVERSITÄT LEIPZIG**



**Leibniz  
Universität  
Hannover**



**UNIVERSITY OF  
TORONTO**



**Technion**  
Israel Institute of Technology



UNIVERSITEIT • STELLENBOSCH • UNIVERSITY



ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE



**IIT  
Delhi**



**THE  
UNIVERSITY OF  
BRITISH  
COLUMBIA**



**UC  
UNIVERSITY OF  
CANTERBURY**  
*Te Whare Wānanga o Waitaha*  
CHRISTCHURCH NEW ZEALAND



**IOWA STATE  
UNIVERSITY**



**Università di Cagliari**



**UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA**