CoMSIRU

Concrete Materials & Structural Integrity Research Unit

ANNUAL REPORT

2018

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

Contents

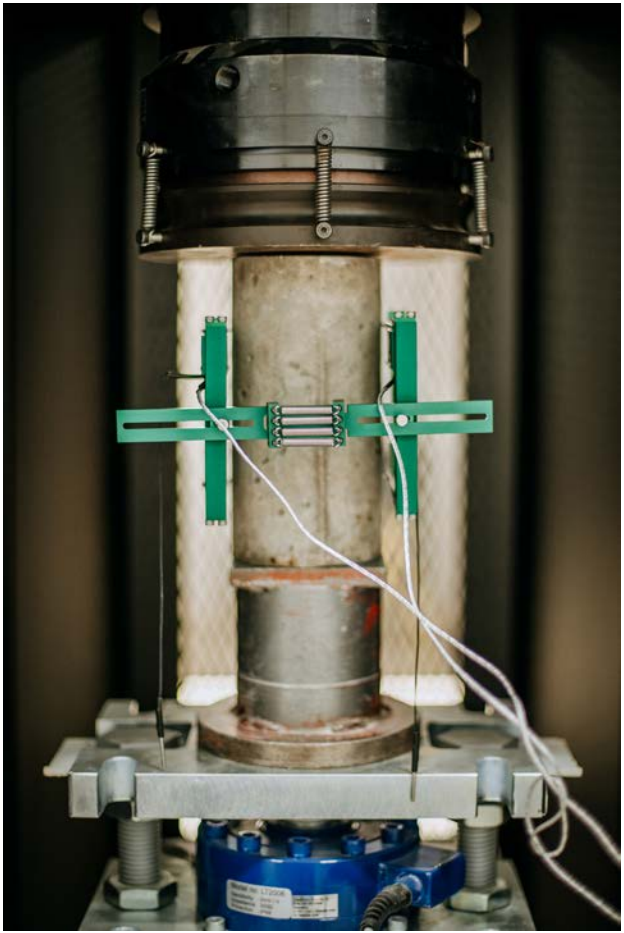
MESSAGE FROM DIRECTOR

PROF PILATE MOYO
Director, CoMSIRU
May 2019

2018 was a difficult year for the construction industry in South Africa, with a number of major construction companies facing liquidation. The implications of losing South Africa's world class construction capability are far reaching for the economy. Infrastructure provision is likely to be more expensive as the country would in future rely on foreign companies. One hopes that this unfortunate situation will lead to the rise of new giants in South Africa's construction industry. A direct consequence of the challenges in the construction industry is reduced investment in research and development. This is happening at a time when we are faced with the need to develop skills for the 4th Industrial Revolution, develop materials and infrastructure design approaches for resilience against new operating environments imposed by climate change and growing urban populations. As a research entity, CoMSIRU recognises these competing challenges. We remain committed to continuous engagement with industry to ensure that our industry remains a world class sector. We continue to expand our research capabilities in order to produce high quality graduates while keeping the construction industry at the forefront of innovation in concrete materials, durability and integrity of concrete structures. To this end we are pursuing work on developing new cements, developing new repair materials and applications of artificial intelligence and machine learning in structural integrity assessment.

CoMSIRU values and appreciates continued industry support.

We look forward to a productive 2019!



INTRODUCTION

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 remains healthy and active, linking 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 recognises the impact of the emergence of "Industry 4.0" and its impact on both research and training needs.

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;
- Promote structural health monitoring as a key tool for structural performance assessment;
- Embrace the opportunities and challenges of Industry 4.0;
- Improve resilience of infrastructure to the effects of climate change.

STAFFING

Prof Pilate Moyo
DIRECTOR SCHOLAR

Prof Hans Beushausen
CO-DIRECTOR

Emer. Prof Mark Alexander
SENIOR RESEARCH SCHOLAR

HONORARY RESEARCH ASSOCIATES / AFFILLIATES

Prof Manu Santhanam
In 2010, Prof Santhanam joined COMSIRU where he has been providing expertise to the unit from the viewpoint of microanalytical characterization of cementitious materials, and participated in the adaptation of the EN concrete standards in South Africa. Prof Santhanam's research interest lies in cement chemistry, materials characterization and non-destructive evaluation.

Mr Vernon Collis
Mr Collis has been co supervising some of our post-grad students with Professor Alexander since 2007 and officially joined the CoMSIRU team four years ago, with research interests in the sustainability arena.

Dr Ines Tchetgnia Ngassam
Joining the CoMSIRU family in 2015 from Cameroon, Dr Ngassam completed her PhD at University of Paris East in France on the durability of reparations made with polymer-modified mortars. Dr Ngassam has been working closely with Professor Beushausen, with her focus on alternative formulations of repair mortars, and has recently joined the Federal Materials Testing Institute (BAM) Berlin.

POSTDOCTORAL RESEARCH FELLOWS

Dr Philemon Arito
Joining the CoMSIRU in 2010 as an MSc (Eng) student from Kenya. Dr Arito received both his MSc and PhD degrees in Civil Engineering from the University of Cape Town. He is currently conducting his postdoctoral research under the guidance of Professor Beushausen. His research interests are in the design and development of effective concrete patch repair mortar formulations and the use of municipal solid wastes in concrete.

Dr Matongo Kabani
Dr Kabani obtained his BScEng (Civil Engineering) from the University of Zambia, and both MScEng and PhD from the University of Cape Town. He works with Professor Moyo, and his research interests cover structural health monitoring and railway bridge loading, bridge dynamics and finite element modelling.

TEACHING ACTIVITIES & 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, 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 its applications in structural engineering. Specifically 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, the structure of a bridge management system and the implementation of bridge management system. Key to this course is practical bridge inspections and case studies.

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, 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, and 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 of 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.

Research methodology and technical writing

This course aims to equip engineering professionals with the transferable skills of technical investigation, technical writing and presentation.

Structural health monitoring & Non-destructive testing of structures

These techniques are increasingly used for structural performance assessment of structures both during construction and operational phases. The course covers instrumentation, data management and analysis and integration of measurement with computational modelling.

Practical Design of floors and footbridges for vibration serviceability

The course is designed to equip engineers with the state of the art on practical design and assessment of floors and footbridges for vibration serviceability.

Condition Assessment of Steel Structures

This course cover approaches for the inspection of steel structures as well as methodologies for structural performance assessment and remedial actions.

CURRENT STUDENTS

In 2018, CoMSIRU registered 55 postgraduate students: (8 PhD, 28 MSc (Eng) and 19 MEng students). 13 Masters students and 2 PhD student graduated in 2018. Details are given in the tables below.

DEMOGRAPHICS

	Total	Female	Male	Black	White	Foreign	South African
PhD	8	1	7	0	0	8	0
MSc (Eng)	28	6	22	7	4	17	11
MEng	19	0	19	3	3	13	6
Grand Total	55	7	48	10	7	38	17

2018 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
P Bukenya	P Moyo MG Alexander	Dynamic characterisation of concrete dams using operational modal analysis
R Heiyantuduwa	MG Alexander	Chloride prediction model for concrete durability
S Surana	H Beushausen MG Alexander	Use of chloride conductivity parameter in chloride prediction models
E Leo	MG Alexander	Development of low-clinker concrete by partially replacing cement with additions of calcined clay and limestone, based on selected African raw materials
T Tshireletso	P Moyo	Predicting the Impact of Climate change on the behavior of concrete Arch Dams in South Africa using non-parametric Machine learning data-models

2018 MSc (Eng) students

NAME	SUPERVISOR	TITLE
A Moore	H Beushausen	Critique of environmental exposure classification for tidal zone
S Ross	MG Alexander V Collis	Bamboo construction as a sustainable building technology from a structural and materials engineering perspective
D Govender	MG Alexander	DI database and integration with SANRAL Management Systems
J Ndawula	S Skatulla H Beushausen	Multiphase modelling of deterioration of reinforced concrete structures
A Goodhead	P Moyo	Fatigue life of prestressed concrete sleepers on an open decked bridge
A Ragoleka	P Moyo	Vibration serviceability of footbridges in SA: An investigation of the crowd capacity of The Boomslang Footbridge
L Thako	P Moyo	Railway tunnels management system in South Africa
A Lekundayo	H Beushausen	Durability design and crack-healing of concrete water retaining structures using crystalline admixtures
B Vukindu	H Beushausen	The performance requirements for bonded concrete overlays with regard to durability and cracking resistance
F Akhalwaya	H Beushausen	A Comparative study between CFRP and Steel prestressed concrete slabs under the serviceability limit state

F Romauld	H Beushausen	Practical application of carbonation models for service life design
M Ngwenya	P Moyo	Rail-bridge interaction
S Marrengane	H Beushausen	An Investigation into Current Concrete Drying Shrinkage and Shrinkage-induced Cracking Test Methods
V James	P Moyo	Fatigue behaviour of corrosion damaged, patch repaired and CFRP strengthened RC beams
Z Mahomed	MG Alexander	Alkali-Aggregate reaction in Western Cape concrete

2017 MEng students

NAME	SUPERVISOR	TITLE
P Bakheit	P Moyo	A Comparative study between CFRP and Steel prestressed concrete slabs under the serviceability limit state
M Mulaudzi	H Beushausen	Quality assurance for the construction of concrete slabs on ground
T Namalima	P Moyo	System analysis of railway bridges with concrete sleepers
D Ngwenya	P Moyo	Collapse of Tongaat Mall
E Nyambalo	H Beushausen	Cathodic protection of reinforcement corrosion-damaged concrete
M Salie	P Moyo	Thesis to be decided
H Van Wijk	P Moyo	Investigating the behaviour of an arch bridge during construction
I Hartley	M Alexander	A critical analysis of the IDMS roll out strategy in local municipality

T Grandeur	H Beushausen	Crack repair in concrete structures
A Marais	H Beushausen	Structural strengthening of masonry houses
M Mulaudzi	H Beushausen	Quality Assurance for the Construction of Concrete Slabs on Ground
Y Salie	H Beushausen	BRT lane service life design and maintenance requirements
B Fredericks	H Beushausen	Cracking in concrete structures and crack width prediction
J Takaindisa	H Beushausen	Development of rural infrastructure management & maintenance systems – a case study of the Joe Gqabi district municipality
K Chirembo	H Beushausen	An assessment of Namibian design and construction industry readiness in implementing performance based durability design and specifications
M Muhenje	H Beushausen	Performance Evaluation of NamWater's Asset Management System and Its Effect on the Safety Monitoring and Maintenance of Concrete Water Retaining Structures
E Rugemalira	P Moyo	Vulnerable zones in railway bridges

Graduated master's degree students (2018)

NAME	SUPERVISOR	TITLE
C Ludwig	P Moyo	The influence of the structure-ballast rail interaction on the dynamic properties of railway bridges
H Sohawon	H Beushausen	Service life extension of reinforced concrete structures using silane impregnation
M Holmes	MG Alexander	The optimisation of the packing of powder materials for the reduction of clinker content in concrete
A Bakera	MG Alexander	Properties of Western Cape concrete with metakaolin
B Nyoni	P Moyo	Numerical modelling of concrete hydropower dams exposed to ASR: long-term environmental effects of climate change
Z Mahomed	MG Alexander	Alkali-Aggregate reaction in Western Cape concrete
N Omar	H Beushausen	Carbonation predictions for Modern South African concretes
D Mashanda	H Beushausen	Concrete deterioration – trends and problems
H Stehle	P Moyo	A comparative study on the structural behaviour of concrete arch dams subjected to swelling due to chemical reaction
G Hove	H Beushausen	Concrete crack repair
O Davis	MG Alexander	Heat transfer through anaerobic digester concrete tank walls
B Rockstroh	H Beushausen	Deflections of suspended RC slabs
M Poyo	H Beushausen	Abrasion resistance of roller compacted concrete used to construct spillway concrete steps of South African dams

Graduated PhD degree students (2018)

NAME	SUPERVISOR	TITLE
P Arito	H Beushausen	The interaction between concrete mix design parameters and constituents and cracking in concrete patch repair materials
M Kabani	P Moyo MG Alexander	Time-dependent bridge network reliability assessment with health monitoring

RESEARCH ACTIVITIES

CoMSIRU's research work is focused on developing a deep understanding of both the short-term 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.and in keeping with the developments in digital technologies.

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 CO2 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. Recent work is now including calcined clays as partial cement replacement materials.

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 collect 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 modelling 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. In addition, 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

PEER-REVIEWED JOURNAL PAPERS

Beushausen, H., Arito, P. (2018), 'The influence of mix composition, w/b ratio and curing on restrained shrinkage cracking of cementitious mortars', Construction and Building Materials, Volume 174, 20 June 2018, Pages 38-46.

Tchetgnia Ngassam, I.L., Arito, P., Beushausen, H. (2018), 'A new approach for the mix design of (patch) repair mortars', African Journal of Science, Technology, Innovation and Development, Vol. 10, issue 3, April 2018.

Schmidt, W., Alexander, M., and John, V. Education for sustainable use of cement based materials. Cement and Concrete Research, http://dx.doi.org/10.1016/j.cemconres.2017.08.009

Alexander, M.G. (2018) "Service life design and modelling of concrete structures – background, developments, and implementation", Revista ALCONPAT, 8 (3), pp. 224-245, DOI: http://dx.doi.org/10.21041/ra.v8i3.325

PEER-REVIEWED CONFERENCE PAPERS

Kay, S., Beushausen, H. (2018), 'The influence of concrete substrate moisture condition on the tensile pull-off strength of protective coatings', Concrete Repair, Rehabilitation and Retrofitting, 2018, Cape Town, November 2018.

Sohawon, H., Beushausen, H. (2018), 'The effect of hydrophobic (silane) treatment on concrete durability characteristics', Concrete Repair, Rehabilitation and Retrofitting, 2018, Cape Town, November 2018.

Ndawula, J., Skatulla, S., Beushausen, H. (2018), 'Numerical model for the penetration of the Iron III chloride in reinforced concrete affected by chloride-induced corrosion using the Theory of Porous Media', Eleventh South African Conference on Computational and Applied Mechanics, SACAM 2018, Sept 2018.

Beushausen, H. Baum, O. (2018), 'The influence of varying binder contents on carbonation of concrete', 4th International Conference on Service Life Design for Infrastructures, Delft, August 2018.

Kanjee, J., Otieno, M., Beushausen, H. (2018), 'Chloride penetration resistance of cracked concrete – applicability of results from uncracked concrete', 4th International Conference on Service Life Design for Infrastructures, Delft, August 2018.

Ndawula, J., Skatulla, s., Beushausen, H., Petersen, J., (2018), 'Modelling the spread of reinforcement corrosion products in concrete using the Theory of Porous Media', 4th International Conference on Service Life Design for Infrastructures, Delft, August 2018.

Moyo P, Nyoni BR and Lennard C (2018), 'effects of climate change on dam safety in South Africa', Proceedings of the Annual SANCOLD 2018 Conference, 9 November 2018, Somerset West, South Africa, pp 157-166, ISBN 978-0-620-81955-87

Nyoni, B.R., Moyo, P., (2018) 'Structural perfomance assessment of concrete dams subjected to alkali-silica reaction using chemo-mechanical modelling Proceedings of the Annual SANCOLD 2018 Conference, 9 November 2018, Somerset West, South Africa, pp 39-46, ISBN 978-0-620-81955-87

Moyo, P., (2018), 'Applications of Ambient Vibration Monitoring in Dam Safety', Proceedings of the Annual SANCOLD 2018 Conference, 9 November 2018, Somerset West, South Africa, pp 1-8, ISBN 978-0-620-81955-87, [Keynote paper]

A Goyns, MG Alexander. "Combining corrosion and structural performance of concrete sewers: implications for pipe design and remaining life". RILEM TC 253-MCI International Conference – Microorganisms-Cementitious Materials Interactions – 2018

M. W. Kiliswa, M. G. Alexander and A. M. Goyns. "Extending the life factor method for predicting sewer corrosion to non-Portland-based cementitious materials – an experimental study". RILEM TC 253-MCI International Conference – Microorganisms-Cementitious Materials Interactions – 2018

BALLIM, Y. and ALEXANDER, M.G. "Guiding principles in developing the South African approach to durability index testing of concrete". Sixth International Conference on the Durability of Concrete Structures, 18-20 July 2018, University of Leeds, Leeds, UK.

Mahomed, Z.L. and Alexander, M.G. "Influence of reactive crushed sand in conjunction with reactive coarse aggregate on the potential of AAR in concrete". SLD4 Conference, RILEM Week 2018, Delft

Gopinath, R. and Alexander, M. G. "A modified carbonation model for concrete subjected to varying humidity conditions". CONMOD 2018

Bakera, A. and Alexander, M. G. (2018) 'Durability properties of concrete containing metakaolin', Proceedings, 4th International Conference on Service Life Design for Infrastructures (SLD4), Ed. G. Ye et al. Paris: RILEM PRO 125, 2018.

Bakera, A.T. Alexander, M.G. "Properties of Western Cape Concretes with Metakaolin". MATEC Web of Conferences 199, 11011 (2018), https://doi.org/10.1051/matecconf/201819911011 ICCRRR2018

Alexander, M.G. and Ballim, B. "Contributions to research development in concrete in South Africa – a 30-year collaborative venture". 3rd R.N. Raikar International Conference and 'Gettu – Kodur' International Symposium, Mumbai, December 2018. Indian Chapter, American Concrete Institute. 10 pp.

Alexander, M.G. and Beushausen, H. “Experiences and challenges in concrete durability research at the University of Cape Town – a 20-year view”. Scrivener and EPFL Anniversary Conference, Lausanne, August 2018. 4 pp.

ALEXANDER, M.G. and BALLIM, Y. “Concrete deterioration and related mechanisms. Experience and needs – a South African perspective”. Nanocem Workshop on Concrete Deterioration Mechanisms, Portmarnock, Ireland, November 2018

ALEXANDER, M.G. and BEUSHAUSEN, H. “Durability of marine reinforced concrete structures informed by field exposure data and observations: South African experience”. 1st International Symposium on Long-term Exposure and Observation of Structures in Ocean Engineering (LEOSOE’2018), Guangzhou, 13 August 2018.

INVITED PRESENTATIONS

Gopinath, R. and Alexander, M.G. “Concrete carbonation – modelling for different binders and variable moisture conditions”. International Symposium on recent Advances in Concrete Construction and Preservation. 3rd K.D. Pradeep Symposium on Pioneering Science and Development for Construction. IITM, Chennai, December 2018.

ALEXANDER, M.G. “Developments in the performance approach for durability and service life prediction for concrete structures”. Lecture to postgraduate students at Hong Kong University of Science and Technology (HKUST), Hong Kong, 08 August 2018

MAHOMED, Z. and ALEXANDER, M.G. “AAR in Western Cape concrete: influence of reactive crushed sand together with reactive coarse aggregate”. Lecture to CSSA Western Cape Branch MTM, August 2018.

P. Moyo, (2018),’Experiences with ambient vibration testing of dams in South Africa’, ICOLD Technical Committee on Dam Surveillance, 86th ICOLD Annual meeting, 1-7 July, Vienna, Austria.

P. Moyo, (2018),’Developments in bridge and tunnel management technologies: A step towards predictive maintenance’, South African Heavy Haul Association Technical Workshop on Embracing the 4th Industrial Revolution in heavy haul railways, 04 – 06 September 2018, Johannesburg, South Africa.

H. Beushausen, ‘Development and Implementation of Performance-based Specifications for Concrete Durability’, Gordon Research Conference on Advanced Materials for Sustainable Infrastructure Development, Hong Kong, August 2018

BOOKS PUBLISHED

5th International Conference on Concrete Repair, Rehabilitation and Retrofitting (ICCRRR 12018)	Editors: Alexander MG, Beushausen H, Dehn F, Moyo P	2018	Publishers: MATEC Web of Conferences Conference held in Cape Town, South Africa ISBN: 9780415396561

AWARDS, PRIZES AND APPOINTMENTS

Two CoMSIRU Students were awarded RILEM Scholarships and Invited to RILEM Week – 2018 which was held in Delft, Netherlands, 26th–29th August 2018. The RILEM Week is the main annual event and conference organised by RILEM (Réunion Internationale des Laboratoires et Experts des Matériaux). It aims at advancing scientific knowledge related to construction materials, system and structures, and encourages the transfer and application of this knowledge.

Ms Alice Bakera

Ms Joanitta Ndawula

Joanitta Ndawula and Alice Titus Bakera were awarded RILEM scholarships. They were among a few individuals globally to receive this highly regarded scholarship, chosen from many applicants from around the world in recognition of their research work. In addition, Alice won the 2018 RILEM Best Student Poster Award in Delft.

Alice Titus Bakera wins the 2018 RILEM Best Student Poster Award

More than 200 researchers from all over the world attended the RILEM conference and shared their expertise and experience. The conference allowed participants to connect, network, and initiate work collaboration in the future.

ORGANISATIONAL ARRANGEMENTS

Governance

CoMSIRU is overseen by its two directors, Prof Pilate Moyo and Prof Hans Beushausen. Emeritus Prof Mark Alexander now plays role of senior advisor to CoMSIRU. Regular meetings are held by these three directors to discuss teaching, research, administration and budget issues. CoMSIRU is serviced administratively and financially by a research administrative finance officer, Mrs Andiswa Sulo.

CoMSIRU Advisory Panel

NAME	COMPANY/INSTITUTION	EMAIL
Pilate Moyo	UCT	pilate.moyo@uct.ac.za
Hans Beushausen	UCT	hans.beushausen@uct.ac.za
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Manu Santhanam	Indian Institute of Technology, Madras	manusanthanam@gmail.com

HIGHLIGHTS

Prof Moyo interviewed on CNBC Africa at the SAHHA Workshop

Prof Moyo was interviewed on CNBC Africa at the SAHHA Technical Workshop. “Embracing the 4th industrial revolution in heavy haul railways – paving the way” was the theme of the workshop at which railway professionals and associates from across the African continent came together to tackle the advancement of the railway and transport industry in Africa. The workshop was held by invitation of the South African Heavy Haul Association (SAHHA), 4–6 September 2018 in Johannesburg. Professor Pilate Moyo, shared insights into new technologies for heavy haul railways and South Africa’s role in advancing these on the continent.

ICCRRR 2018 Conference

CoMSIRU organized 5th International Conference on Concrete Repair, Rehabilitation and Retrofitting, which took place in Cape Town in November 2018 and attracted close to 300 local and international delegates. Now established as the leading international scientific event of the concrete repair industry, ICCRRR 2018 included topics relates to concrete durability (design, materials, service life modelling), condition assessment of concrete structures (strategies, NDT), repair of RC structures (related to reinforcement corrosion, chemical attack, ASR, etc.) and strengthening of concrete structures (design principles, modern developments, FRP, seismic retrofit, etc.). The next ICCRRR is due to take place in Germany in 2020.

FINANCIAL STATEMENT

		2017	2018
TOTAL INCOME	INDUSTRY INCOME	R 4 129 210,53	R 1 113 156,24
	GRANTS/CONTRACTS	R 616 816,00	R 2 425 342,11
	INVESTMENT FUND	R 712 680,68	R 52 248,23
	CARRY OVER	R 1 614 191,62	R 2 520 620,76
	TOTAL	**R 7 072 898,83**	**R 3 590 746,58**
TOTAL EXPENSES	STAFFING COSTS	R 908 528,80	R 1 366 741,11
	BUSARIES	R 1 558 893,55	R 1 768 314,00
	ADMIN & OPERATING EXPENSES	R 265 825,91	R 457 355,76
	CONFERENCE & REGISTRATION EXPENSES	R 43 574,26	R 85 036,70
	LOCAL TRAVEL	R 43 574,26	R 185 011,11
	FOREIGN TRAVEL	R 410 638,38	R 481 256,42
	EQUIPMENT	R 474 658,19	R 99 042,38
	OTHER COSTS	R 17 388,53	R 202 179,70
	COST RECOVERY	R 294 537,38	R 387 882,89
	LAB EXPENSES	R 435 636,04	R 252 149,52
	TOTAL	**R4 531 488,62**	**R 5 284 969,59**
	BALANCE	**R 2 541 410,21**	**R 826 397,75**

FUNDERS


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