



Proceedings of Civil Engineering Research Symposium 2016 (CERS 2016)



8th December 2016

Department of Civil Engineering
University of Moratuwa

CIVIL ENGINEERING RESEARCH SYMPOSIUM-2016

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Sri Lanka

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Message from the Vice-Chancellor

I am pleased to send this message to mark this year's Civil Engineering Research Symposium (CERS) which has now become an important annual event of the Department of Civil Engineering. I was very pleased to note the enthusiasm of the Department to organize this focused research symposium demonstrating its individual contribution for university research. The Department of Civil Engineering is therefore a trend setter for the other departments to drive research and to hold focused research symposia.

One of the goals that the University strives to achieve is to have a thriving and sustainable research and innovation culture in our march towards a world class university. To this end, attempts are made to attract funding from international offers, private sector funding leveraging 300% tax concession for research investment, international collaborations and funding from other local institutions in addition to enhanced Senate Research Grants this year. This is a great opportunity for Civil Engineering Department to significantly contribute for development of alternative/new materials, new construction technologies, new building components to support rapid infrastructure development of our country which is a prerequisite for our march towards a middle income nation. It is expected that Faculty of Graduate Studies, Office of Research and Office of International Relations will significantly boost our research outputs both locally and internationally.

It is my hope that this Symposium will not only disseminate Civil Engineering research findings but also create further opportunities to identify new directions, obtain ideas for more development oriented research, attract further research funding and more importantly it makes a launching pad for high end publications in indexed journals.

While expressing my appreciation to the Head/Department of Civil Engineering and the organizing committee for dedicatedly organizing this Symposium, congratulating the authors of the papers for their achievements, I wish Civil Engineering Research Symposium 2016 a great success.

Prof. Ananda Jayawardane
Vice-Chancellor

Message from Dean, Faculty of Engineering

It is an undeniable fact that research and development had resulted in the developments in any sphere of activity that the mankind have the luxury of utilizing and enjoying at present. Research can be comprehended in general, on one hand as “a systematic investigative process adopted to increase or revise current knowledge by discovering new facts for solving problems or developing new processes, products, or techniques. Discovery of fire during the Stone Age fits into this comprehension. Therefore, the aforementioned undeniable fact with regard to research and development is valid for the past and the present. Even in future this fact will remained unchallenged. Although the discovery of fire may not have led to the coining of the word “research” then and the presentation of that great discovery “fire” as a “research outcome or output” in the formal manner such as this “Civil Engineering Research Symposium 2016 (CERS 2016)” or any other research symposia, the use of it has come to stay for ever for the benefit of the living beings. With the increase of the unparalleled quest for discovering new knowledge or in other word growth of research activities the research symposia have evolved as a one of the formal modes of dissemination of the research activities. Also the symposia provides a flat form or an opportunity for the researchers to testify the validity as well as quality of their research outcomes with the fellow researches in the respective disciplines. Research Symposia have become a universal standard of one of the modes of dissemination of research activities carried out by inquiring minds for the benefit of global livelihoods more than a tradition.

On the same token, on behalf of the Faculty of Engineering, I wish to congratulate the Department of Civil Engineering of the University of Moratuwa for organising the "Civil Engineering Research Symposium 2016 (CERS 2016)".

I am pleased to note that the CERS 2016 has evolved as an annual calendar event since its inception in 2011. Sustaining since 2011 and ever increasing standard and quality of each research symposia itself bears testimony to the keenness of the Civil Engineering fraternity of the Faculty in research and the growth of research activities.

Contribution of the CERS 2016 is no doubt help uplift University’s research profile and is recognized and applauded by all of us at the Faculty of Engineering which is a boost to the University’s quest for climbing the world rankings.

I wish to convey my thanks to Professor Saman Bandara , Head, Department of Civil Engineering, Chairman of the Symposium, Editor of the Symposium, and the Organising Committee, for organising the Civil Engineering Research Symposium 2016.

Professor K. K.C.K. Perera
Dean, Faculty of Engineering
07th December 2016.

Message from Head/ Department of Civil Engineering

The Civil Engineering Research Symposium (CERS) was first held in 2011 as a forum for disseminating findings of undergraduate and postgraduate research carried out in the department for the industry and for mutual exchange of views among engineers, researchers and academics. Since then it has become an annual event of the department.

The role of a university is not only disseminating knowledge but also creating new knowledge through research at the highest possible level. Our research findings should be useful to industry and society; and also to develop the country and uplift the standard of living of people. Around the world, countries have recognised that universities, especially research universities, are the key to the knowledge economy of the 21st century.

Our staff members are very active in research work in a wide spectrum of Civil Engineering specialities such as Building and Structural Engineering, Construction Engineering and Management, Environmental Engineering, Geotechnical Engineering, Hydraulic and Water Resources Engineering and Transportation Engineering and many other areas related to Civil Engineering. Majority of our staff members we have established collaborative research links with the industry, research organizations and universities at national and international level. Both undergraduate and postgraduate research also have contributed towards improving our research outputs and the Department is directly and indirectly involved in organizing national and international level research conferences to disseminate the knowledge throughout the year.

Final year undergraduate research projects have played an important role in establishing the research culture in the department. They were initiated as group research projects, but from 2013, individual research projects were introduced to give more exposure for students to carry out an independent research study. The proceedings of this year's Symposium contain 16 research papers mainly based on undergraduate research work. All the papers have gone through a double-blind peer review process to ensure the quality of publications.

I take this opportunity to congratulate all the authors whose research papers have been selected for the presentation at this year's symposium. I would like to thank the organizing committee, all staff and students of the department who have contributed in many ways towards the successful technical programme and symposium proceedings of CERS 2016. My sincere thanks goes to the keynote speaker Dr. Asiri Karunawardena, Director General, National Building Research Organization, and the reviewers who carried out the most difficult task of carefully evaluating the papers submitted. Generous financial support from Ceylon Steel Corporation Pvt Ltd for this occasion is highly appreciated.

Prof. J.M.S.J. Bandara
Head/Department of Civil Engineering

Acknowledgement

This is the Fifth Civil Engineering Research Symposium (CERS) following the successful symposia in 2011, 2012, 2014 and 2015. Papers presented this year are based on undergraduate research projects of 'Batch 11'. At present final year students carry out research projects on an individual basis and the research symposium provides an opportunity to present their research findings in written and oral form to a general audience thus enabling them to enhance their research and presentation skills. The four page paper format trains them to present their research findings with clarity in a concise manner.

The audience for the symposium is composed of; invited industry representatives, academic staff and final year students who are at presently engaged in their research projects. This is an opportunity for the students to realise for themselves, the standards they should strive to achieve in their own projects.

The keynote speaker for the event is Dr. Asiri Karunawardena, Director General of National Building Research Organisation (NBRO). Over the last two decades NBRO has made a very significant contribution towards the reduction of landslide risk in the country on different fronts such as; development of hazard zonation maps, installation of early warning systems, investigations on potentially unstable sites and design of mitigation/rectification measures. Landslides are a major challenge faced by Civil Engineers in Sri Lanka and this event will provide a very good opportunity to the undergraduates to learn how very challenging situations are met by application of sound engineering principles and judgement. The organising committee expresses their sincere gratitude to Dr. Karunawardena, an alumnus of this Department, for accepting our invitation to deliver the keynote lecture.

This symposium is held with the blessings of the Vice Chancellor and the Dean of Faculty of Engineering. The organising committee wish to thank the Vice Chancellor and the Dean, Faculty of Engineering for their wholehearted support. A big Thank you is due to the Head of the Civil Engineering Department who motivated us to do our best with his encouragement.

Thank you to the authors of the papers without whom this event would not be a reality. Each paper was subjected to a single blind review process by two reviewers. A special word of thanks to the editorial and review panels for ensuring that quality is maintained. The assistance of Ms Pradeepa Peiris in formatting the conference proceedings to perfection and Universal Printers for printing them at short notice is much appreciated.

The organisers also wish to thank all those who assisted in numerous ways.

This year the symposium is sponsored by Ceylon Steel Corporation Ltd. We thank them for their generous contribution and hope they will continue to partner us in the future too.

On behalf of the Organising Committee

Prof. Athula Kulathilka (Conference Chair)

Civil Engineering Research Symposium 2016

December 8, 2016

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CONTENTS

1.	<p>Assessment of Groundwater Resource Utilization in Wet and Dry Zone Aquifers in Sri Lanka and Quantifying Recharge Losses due to Urbanization and Land-use Change</p> <p>M.A.A.R.Dilhara and R.L.H.L.Rajapakse <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	01
2.	<p>Quality Management Practices Among Large Scale Building Contractors</p> <p>H.S. Wickramage and N.D. Gunawardena <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	04
3.	<p>Effective Applications of Poker Vibrator for Compacting Quarry Dust as a Ground Improvement Technique</p> <p>K. H. S. M. Sampath and L. I. N. De. Silva <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	08
4.	<p>Determination of Permeability Characteristics and SWCC of an Unsaturated Residual Soils in Sri Lanka</p> <p>G.K.G.M.Karunasena and S.A.S. Kulathilaka <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	12
5.	<p>Effect of Salinity on Consolidation of Peat</p> <p>K.H.S.S. De Silva and U.P. Nawagamuwa <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	16
6.	<p>Limiting Values for Temperature Differentials to Control Early Age Thermal Cracking of Concrete</p> <p>A.W.R.M.G.W.D.B. Girihagama and S.M.A. Nanayakkara <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	20
7.	<p>Investigation of Utilization of Manufactured Sand in Cement Mortar</p> <p>D.L.W. Padmasiri and S.M.A. Nanayakkara <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	24
8.	<p>Comparison of Built up Timber Beams with Timber Trusses</p> <p>K.D.N. Perera and M.T.P. Hettiarachchi <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	28
9.	<p>Comparison of Design of Stone Columns by Limit Equilibrium and Finite Element Methods</p> <p>W.L.D.H.A. Perera and S.A.S. Kulathilaka <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	32
10.	<p>Study of Permeability Characteristics of Open Graded Friction Courses Used in Wearing Courses</p> <p>K. Umasangar and W.K. Mampearachchi <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i></p>	36

11.	Development of Expanded Clay as an Internally Curing Concrete Aggregate M.M.H.W Bandara and W.K. Mampearachchi <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i>	40
12.	Study on Materials for Building Envelope Considering Energy T.N.B.Ekanayake and K.Baskaran <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i>	44
13.	Soil Contamination by Direct Disposal of Reverse Osmosis Reject Water onto the Ground in the Chronic Kidney Disease of Unknown Etiology (CKDu) Prevalent Areas P.A.V.G. Jayathilaka and W.B. Gunawardana <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i>	48
14.	Development of an Undisturbed Method to Measure Density of Improved Municipal Solid Waste using Heavy Tamping A.B.M.R.S. Basnayake and U.P. Nawagamuwa <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i>	53
15.	Investigating of Thermal Optimization of Mud Concrete B.V.D.N. Bandara, F.R. Arooz and R.U. Halwatura <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i>	57
16.	Effect of Gravel Size on Strength of Mud Concrete D.M.H.C. Bandara, F.R. Arooz and R.U. Halwatura <i>Department of Civil Engineering, University of Moratuwa, Sri Lanka</i>	61