

The Eighth International Conference on Structural Engineering, Mechanics and Computation

Cape Town, South Africa, 5-7 September 2022

FINAL PROGRAMME

Welcome Reception: Sunday 4 September
Leslie Social Sciences Building, Upper Campus, University of Cape Town

15:30-18:00 Onsite Registration & Collection of Conference Bags
17:00-17:10 Welcome by the Conference Chair (Prof. Alphose Zingoni)
17:10-18:00 Conference Welcome Reception

Opening Session: Monday 5 September
Graduate School of Business, University of Cape Town, Cape Town Waterfront

07:30-10:00 Onsite Registration & Collection of Conference Bags
07:30-08:00 Arrival Tea and Coffee
08:00-08:20 Introduction and Overview by the Conference Chair (Prof. Alphose Zingoni)
08:20-08:30 Welcome by UCT Deputy Vice-Chancellor for Research (Prof. Sue Harrison)
08:30-10:00 Keynote Lectures

Conference Dinner: Tuesday 6 September
Kirstenbosch Botanical Gardens, Newlands, Cape Town: 19:00-22:00

Plenary & Parallel Sessions: Monday 5 – Wednesday 7 September
Graduate School of Business, University of Cape Town, Cape Town Waterfront

General Programme Structure

08:00-08:30 Tue & Wed: Arrival Tea and Coffee
08:30-10:00 Mon, Tue & Wed: Plenary Session
10:00-10:30 Tea & Coffee Break
10:30-12:30 Mon, Tue & Wed: Parallel Sessions: 6 Streams (A to F)
12:30-13:30 Lunch Break
13:30-15:00 Mon, Tue & Wed: Parallel Sessions: 6 Streams (A to F)
15:00-15:30 Tea & Coffee Break
15:30-17:00 Mon, Tue & Wed: Parallel Sessions: 6 Streams (A to F)

General Note

The four timetable periods of the Conference, from 5 to 7 September, will be denoted as follows:
Period 1: 08:30-10:00; **Period 2:** 10:30-12:30; **Period 3:** 13:30-15:00; **Period 4:** 15:30-17:00
Plenary sessions will run in Period 1. Parallel sessions will run in Periods 2, 3 and 4.

Plenary Presentations: Keynote Lectures

Monday 5 September: Period 1: 08:30-10:00
Chair: Prof. M.A. Wadee, Imperial College London, UK

08:30-09:15 **Metal additive manufacturing in structural engineering: Review, opportunities and outlook**
Professor Leroy Gardner, Imperial College London, UK

09:15-10:00 **Computational modeling of fibre-reinforced concrete: From 3D printing to robust design**
Professor Günther Meschke, Ruhr University Bochum, Germany

Tuesday 6 September: Period 1: 08:30-10:00
Chair: Prof. L.C. Bank, Georgia Institute of Technology, USA

08:30-09:15 **In-test analytical model updating for accurate hybrid dynamic simulations**
Professor Amr Elnashai, University of Houston, USA

09:15-10:00 **Fibre-reinforced polymer strengthening of metallic structures: From research to practice**
Professor Xiao-Lin Zhao, Hong Kong Polytechnic University, China

Wednesday 7 September: Period 1: 08:30-10:00
Chair: Prof. G. De Roeck, Catholic University of Leuven, Belgium

08:30-09:15 **Value of vibration-based structural monitoring for bridge emergency management**
Professor Maria Pina Limongelli, Politecnico di Milano, Italy

09:15-10:00 **Understanding tensegrity with an energy function**
Professor Simon Guest, University of Cambridge, UK

Parallel Session Presentations

Mon 5 Sept, Tue 6 Sept, Wed 7 Sept: Periods 2, 3 & 4

Six streams of parallel presentations (each allocated its own venue) will run throughout the Conference. These streams are broadly defined in terms of the topics covered, as follows:

STREAM A: Dynamic Analysis, Vibration Response, Vibration Control, Environmental Vibrations, Seismic Response, Seismic Analysis, Earthquake-Resistant Design, Foundations, Geotechnical Engineering, Rock Mechanics, Structural Reliability, Design Philosophy, Engineering Education, Transport Infrastructure, Building Performance

STREAM B: Material Modelling, Damage Mechanics, Blast, Impact, Fracture, Fatigue, Composite Structures, Laminated Structures, Sandwich Structures, Additive Manufacturing, 3D Printing, Industrial Processes, Numerical Analysis, Numerical Modelling

STREAM C: Shells, Membranes, Cable-Stayed Structures, Spatial Structures, Lightweight Structures, Form-Finding, Glass Structures, Timber Structures, Performance of Structures in Fire, Concrete-Filled Steel Tubes, Progressive Collapse, Structural Robustness

STREAM D: Buckling of Thin-Walled Structures, Steel Structures, Steel Connections, Steel-Concrete Composite Construction, Cold-Formed Steel, High Strength Steel, High Performance Steel

STREAM E: Reinforced Concrete Structures, Prestressed Concrete, Mechanics of Concrete, High Strength Concrete, High Performance Concrete, Fibre-Reinforced Concrete, Fatigue Behaviour of High Performance Concrete, Structural Applications of FRP Composites, Historical Structures, Monuments, Preservation

STREAM F: Structural Health Monitoring, Damage Detection, Damage Identification, Structural Assessment, Maintenance, Repair, Strengthening, Retrofitting, Masonry Structures, Construction Technology, Construction Projects, Construction Materials

Programme for Parallel Sessions

The Programme for Parallel Sessions is presented below, stream by stream. The session code has 4 characters: the first is a letter indicating the **Stream** (A, B, C, D, E or F), the second is a hyphen, the third is a letter indicating the **Day** (M: Mon; T: Tue; W: Wed), and the fourth is a number indicating the **Period** (2, 3 or 4). For example, D-T3 denotes the parallel session of Stream D that runs on Tuesday in Period 3 (13:30-15:00). Period 1 (08:30-10:00) is reserved for Plenary Sessions. Excluding the Plenary Sessions, the Programme features a total of 54 Parallel Sessions.

STREAM A

A-M2: Dynamic Analysis, Vibration Response, Vibration Control I

Special Session SS17: Environmental Vibrations. Organisers: Prof. Lars Vabbersgaard Andersen, Aarhus University, Denmark; Dr. Peter Persson, Lund University, Sweden

Chairs: Prof. L.V. Andersen, Aarhus University, Denmark; Dr. P. Persson, Lund University, Sweden

10:30: Early assessment of the vibroacoustic performance of large lightweight buildings, L.V. Andersen, L. Mangliár, M.M. Hudert, O. Flodén, P. Persson (**Invited Paper**)
11:00: Modal analysis of CLT beams: Measurements and predictive simulations, B. Bondsman, O. Flodén, H. Danielsson, P. Persson, E. Serrano
11:15: The influence of near-surface soil layer resonance on vibrations in pile foundations, F. Theland, C. Pacoste, J.M. Battini, G. Lombaert, S. François, F. Deckner
11:30: The effect of pile slip on underwater noise emission in vibratory pile driving, T. Molenkamp, A. Tsouvalas, A.V. Metrikine
11:45: Vibroacoustic performance of multi-storey buildings: A comparison of lightweight and heavy structures in the early design phase, L.V. Andersen, L. Mangliár, M.M. Hudert, O. Flodén, P. Persson
12:00: Effect of modelling the air in rooms on the prediction of vibration transmission in cross-laminated timber buildings, O. Flodén, A. Peplow, P. Persson, L. Mangliár, L.V. Andersen
12:15: Numerical analysis of transversely isotropic unsaturated railway ground vibrations under a moving load using 2.5D FEM, S. Li

A-M3: Dynamic Analysis, Vibration Response, Vibration Control II

Chair: Dr. A. Palmeri, University of Loughborough, UK

13:30: Bridge flutter and how to prevent it at low cost, U. Starossek (**Invited Paper**)
14:00: Prediction of flutter velocity of long-span bridges using probabilistic approach, S. Tinmitonde, X. He, L. Yan
14:15: Numerical investigation on train-bridge interaction after ship impact event: Train running safety in different scenarios, L. Bernardini, G. Soldavini, A. Collina
14:30: Dynamic analysis of highly symmetric cable dome structures, L. Fan, Y. Chen, C. Lu, Y. Sun
14:45: Effect of Cape storms on the flat roof-mounted solar panels, Y. Kiama, J. Mahachi

A-M4: Dynamic Analysis, Vibration Response, Vibration Control III

Chairs: Prof. U. Starossek, Hamburg University of Technology, Germany; Dr. A. Palmeri, University of Loughborough, UK

15:30: Research advancement on submerged floating tunnels: Recent activity at DICA, Politecnico di Milano, F. Foti, L. Martinelli, M.G. Mulas, F. Perotti (**Invited Paper**)

16:00: Optimal design of viscoelastic tuned mass dampers for structures exposed to coloured excitations, M. Argenziano, E. Mele, A. Palmeri
16:15: Incremental dynamic analysis of a hospital building in Oman, M.B. Waris, K. Al-Jabri, W.H. Bhuta, I. El-Hussain
16:30: Dynamic response of antenna structure subjected to shock load and base excitation considering soil structure interaction, V.L. Gullapalli, R.R. Kumar, G.R. Reddy
16:45: Evaluating static and modal responses of a small scale conventional and bio-inspired wind turbine blade, T. Babawarun, H.M. Ngwangwa, A.G. Netshivhulana, T. Pandelani, W.H. Ho

A-T2: Seismic Response, Seismic Analysis, Earthquake-Resistant Design I
Chair: Prof. A. Elnashai, University of Houston, USA

10:30: Functional elements exploiting superelasticity and the shape memory effect of Fe-Mn-Al-Ni-X shape-memory alloys in structural engineering, E. Fehling, B. Middendorf, J. Thiemicke, M. Vollmer, A. Bauer, T. Niendorf, V.v. Oertzen, B. Kiefer (**Invited Paper**)
11:00: Load-level isolation system for industrial racks: Evaluations on a case study structure, E. Bernardi, M. Donà, A. Zonta, M. Ceresara, S. Mozzon, F. da Porto, P. Tan
11:15: Seismic considerations in the dynamic characteristics of masonry infilled RC frames based on experimental tests, F.J. Pallarés, A. Agüero, L. Pallarés
11:30: Structural plan and design of bridge deck isolation system for seismic redundancy, M. Matsumura, K. Annoura, H. Moriyama
11:45: Study on seismic performance of fully bolted joints, B.L. Wu, Y.X. Zhang, S. Shen, Z.W. Huang
12:00: Effects of in-plan irregularity of RC framed buildings on the out-of-plane nonlinear seismic response of masonry infills, F. Mazza
12:15: Influence of infill walls on lateral load carrying capacity of buildings, M.B. Waris, H. Al-Hadi, A. Al-Nuaimi

A-T3: Seismic Response, Seismic Analysis, Earthquake-Resistant Design II
Chairs: Prof. I.N. Robertson, University of Hawaii, USA; Prof. G. De Matteis, University of Campania Luigi Vanvitelli, Italy

13:30: Seismic response of curved structures in historical masonry churches, C. Chisari, M. Zizi, J. Rouhi, G. De Matteis (**Invited Paper**)
14:00: Dynamic characterization of the Tower of Palazzo dei Vicari in Scarperia (Italy) during and after the 2019 Mugello seismic sequence, R.M. Azzara, V. Cardinali, M. Girardi, F. Marini, C. Padovani, D. Pellegrini, M. Tanganelli
14:15: Push-over tsunami analysis using *ETABS*, D.W. Aegerter, I.N. Robertson
14:30: Seismic fragility of corroded reinforced concrete highway bridges, S. Biswas, G.K. Verma, P. Sengupta

A-T4: Seismic Response, Seismic Analysis, Earthquake-Resistant Design III
Chairs: Prof. G. De Matteis, University of Campania Luigi Vanvitelli, Italy; Prof. I.N. Robertson, University of Hawaii, USA

15:30: Recent advances in tsunami design of coastal structures, I.N. Robertson (**Invited Paper**)
16:00: Assessment of the inter-storey isolation technique applied to an existing school building, M. Donà, E. Bernardi, A. Zonta, E. Saler, F. da Porto
16:15: Effects of frequency content of ground motions on seismic response of concrete gravity dams with varying reservoir levels, G. Reddy, M. Shrikhande
16:30: A proposal for improving the elastic behaviour of dogbone, L. Palizzolo, S. Benfratello, S. Vazzano

A-W2: Foundations, Geotechnical Engineering, Rock Mechanics
Chair: Prof. S. Leppla, Frankfurt University of Applied Sciences, Germany

10:30: Interaction between the deepest foundation piles in Germany and the superstructure, R. Katzenbach, A. Werner, S. Fischer (**Invited Paper**)
11:00: Derivation of cyclic p-y curves for the design of monopiles in sand**,** M. Achmus, J. Song
11:15: Climate-smarter design of soil-steel composite bridges using set-based design, J. Lagerkvist, C.G. Berrocal, R. Rempling
11:30: Parametric modelling of integral bridge spring reactions, N.R. Featherston, C. Viljoen
11:45: A parametric study of the vibration of beams resting on elastic foundations with nonlinear cubic stiffness, E. Feulefack Songong, A. Zingoni
12:00: Degradation of axial friction resistance on buried district heating pipes, T. Gerlach, M. Achmus
12:15: A hybrid structure to protect infrastructures from high energy rockfall impacts, M. Marchelli, V. De Biagi

A-W3: Structural Reliability, Design Philosophy, Engineering Education
Chairs: Prof. J.V. Retief, University of Stellenbosch, South Africa; Mr. P.M. Debney, Arup/Oasys, UK

13:30: Framing of the design base for load bearing structures against climate change, J.V. Retief (**Invited Paper**)
14:00: Structural reliability estimates by Slepian models, M. Grigoriu
14:15: Do we still need structural engineers?, P.M. Debney
14:30: Facilitated teambuilding processes to enhance teamwork skills in engineering education, L. Bücking
14:45: Peer review of teaching/learning paradigms: A new proposal for engineering education, M. Saudy, I. Abotaleb, K. Nassar, E. Sayed-Ahmed

A-W4: Transport Infrastructure, Building Performance
Chair: Prof. J. Mahachi, University of Johannesburg, South Africa

15:30: Field and desktop survey on failures of rail to concrete connections in South African track on concrete ballastless railway systems, W.M.P. Makwela, J. Mahachi
15:45: Implication of constructing the new Umhlatuzana River bridge deck monolithically with the existing deck, A.J. Faure
16:00: Research for achieving high quality air in architecture and urban planning on the example of the educational and sports center in Józefów near Warsaw, J. Wrana, W. Struzik
16:15: Cooling materials that help save lives in the context of COVID-19's economic recession, F. Pacheco-Torgal
16:30: Long term energy efficiency of non-conventional building systems: Use of polyblocks in improving thermal performance, D.M. Tshilombo, S.A. Alabi, J. Mahachi
16:45: Microorganisms and the healthy built environment, F. Pacheco-Torgal

STREAM B

B-M2: Material Modelling I
Chairs: Prof. J. Schröder, University of Duisburg-Essen, Germany; Prof. S. Schmauder, University of Stuttgart, Germany

10:30: Multiscale modelling in materials science and technology, D. Rapp, C. Xu, F. Sajadi, X. Xu, S. Schmauder (**Invited Paper**)

11:00: A multiscale approach to investigate residual stresses due to targeted cooling of hot bulk formed parts, S. Hellebrand, D. Brands, L. Scheunemann, J. Schröder
11:15: Introduction to lattice discrete particle model for thermoset polymers, J. Vorel, J. Vozáb, J. Kruis
11:30: Artificial neural networks as material models for finite element analysis, D. Sommer, B. Troff, P. Middendorf
11:45: Simulations of elasto-plastic soils within the framework of the theory of porous media, J. Sunten, A. Schwarz, J. Bluhm, J. Schröder
12:00: A coupled multi-field dynamic model for anisotropic porous materials, N. De Marchi, M. Ferronato, G. Xotta, V.A. Salomoni
12:15: Variational formulation of weak layer stresses in stratified snowpacks, F. Rheinschmidt, P. Weißgraeber, P.L. Rosendahl
12:30: Micromechanical modelling of failure during interactions between ice and subsea structures, R.S. Taylor, I. Gribanov

B-M3: Material Modelling II

Chairs: Prof. J. Schröder, University of Duisburg-Essen, Germany; Prof. S. Schmauder, University of Stuttgart, Germany

13:30: An exact stiffness matrix method for nanoscale beams, R.A.R. Wijesinghe, K.K.V. De Silva, Y. Sapsathiarn, N. Rajapakse
13:45: On the deformation of porous spherical shells and other spherical bodies, S. De Cicco
14:00: Nonlocal beam analysis based on the stress-driven two-phase theory, F.P. Pinnola, M.S. Vaccaro, R. Barretta, F. Marotti de Sciarra
14:15: Modeling the hysteresis behavior of recycled rubber fiber reinforced bearings, A. Flora, D. Cardone, A. Calabrese
14:30: Numerical permeability prediction of multiscale textile architectures with varying contact angle and surface tension, J. Dittmann, P. Seif, P. Middendorf
14:45: Data-driven design of high ductile metamaterials under uniaxial tension, A.S. Bhuwal, Y. Pang, T. Liu, I. Ashcroft, W. Sun

B-M4: Material Modelling III

Special Session SS23: Mechanical Characterisation of Biological Tissue. Organisers: Dr. T. Pandelani & Dr. D. Modungwa, Council for Scientific and Industrial Research, South Africa; Prof. F. Nemavhola & Dr. H. Ngwangwa, University of South Africa; Prof. D. Desai, Tshwane University of Technology, South Africa
Chairs: Dr. T. Pandelani, Council for Scientific and Industrial Research, South Africa; Prof. D. Desai, Tshwane University of Technology, South Africa; Prof. F. Nemavhola, University of South Africa

15:30: Application of quasi-linear viscoelasticity for the characterisation of human buttocks adipose tissue, T. Pandelani, S.D. Masouros, J.L. Calvo-Gallego
15:45: Investigation of the performance of different constitutive models on omasum uniaxial tensile behaviour, H.M. Ngwangwa, L. Lebea, F. Nemavhola, T. Pandelani, D. Modungwa
16:00: Evaluating the tensile behaviour of rat myocardium across its three walls from biaxial tensile test data, H.M. Ngwangwa, M. Msibi, I. Mabuda, F. Nemavhola, T. Pandelani
16:15: Investigation on 3D printed dental titanium Ti64ELI and lifetime prediction, L. Lebea, H.M. Ngwangwa, D. Desai, F. Nemavhola
16:30: Modelling of biaxial tensile behaviour of the tracheal tissue using three exponential-based hyperelastic constitutive models, H.M. Ngwangwa, L. Semakane, F. Nemavhola, T. Pandelani, D. Modungwa
16:45: Evaluating computational performances of Yeoh, Veronda-Westmann and Humphrey models on supraspinatus tendon uniaxial stress-strain behaviour, H.M. Ngwangwa, M. Msibi, I. Mabuda, F. Nemavhola

17:00: The dynamic tensile loading on the mechanical properties of singly curly fiber, L.B. Mathebela, T.L.M. Lekwana, H. Ngwangwa, T. Pandelani, D. Modungwa, F. Nemavhola

B-T2: Damage Mechanics I: Blast and Impact

Chair: Prof. S. Chung Kim Yuen, University of Cape Town, South Africa

10:30: Using optical diagnostics for near field blast testing, G.S. Langdon, R.J. Curry, S.E. Rigby, E.G. Pickering, S.D. Clarke, A. Tyas, S. Gabriel, S. Chung Kim Yuen, C.J. von Klemperer (**Invited Paper**)
11:00: Blast response of arching masonry walls: Theoretical and experimental investigation, I.E. Edri, D.Z. Yankelevsky, O. Rabinovitch (**Invited Paper**)
11:30: Blast behaviour of natural fibre composites: Response of medium density fibreboard and flax fibre reinforced laminates, S. Gabriel, S. Chung Kim Yuen, G.S. Langdon, C.J. von Klemperer
11:45: Comparison of TNT to PE4 charge using a simplified rigid torso, T. Pandelani, D. Modungwa, S. Hamilton, J.D. Reinecke
12:00: From skin and bones to blast loading of structures: Seeking the constants, G. Nurick
12:15: Blast performance of retrofitted reinforced concrete highway bridges, S. Biswas, S. Kulshreshtha, P. Sengupta
12:30: Investigation of permanent indentation due to low velocity impact on glass fibre reinforced plastics, M. Bastek, L. Merkl, P. Middendorf

B-T3: Composite, Laminated and Sandwich Structures

Chair: Prof. J. Gajewski, Lublin University of Technology, Poland

13:30: Minimum weight design of CNT/fiber reinforced laminates subject to a frequency constraint, S. Anashpaul, G.A. Drosopoulos, S. Adali
13:45: On the application of CFD and MDO to aircraft wingboxes using commercial software, X. Duan, K. Behdinan
14:00: Piezoresistive sensor matrix for adaptive structures, H. Fritz, C. Walther, M. Kraus
14:15: Numerical modelling of the residual burst pressure of thick composite pressure vessels after low-velocity impact loading, R. Czichos, P. Middendorf, T. Bergmann
14:30: Moment support interaction of multi-span sandwich panels, A. Engel, J. Lange
14:45: Influence of interfacial debonding on the nonlinear structural response of profiled metal-faced insulating sandwich panels, M.N. Tahir, E. Hamed
15:00: Influence of temperature on sandwich panels with PU rigid foam, S. Steineck, J. Lange

B-T4: Damage Mechanics II: Fracture and Fatigue

Chairs: Prof. G. Nurick, University of Cape Town, South Africa; Prof. M. Rauch, Hochschule Kaiserslautern, Germany

15:30: Advanced fatigue assessment methods: The future of modern wind turbines, M. Rauch, R. Yildirim, H. Bissing, M. Knobloch
15:45: Decoupling method for fracture modes in an orthotropic elastic material through a three-dimensional vision, J. Afoutou, F. Dubois, N. Sauvat, M. Takarli
16:00: Detection of fatigue damage via neural network analysis of surface topography measurements, H. Alqahtani, A. Ray
16:15: Theoretical and experimental investigation into area increase of longitudinal cracks in pressurised pipes, D.T. Ilunga, M.O. Dinka, D.M. Madyira
16:30: Notch stress analysis on reinforcing steel bars using FE-simulations considering surface topography and structure properties, S. Rappl, K. Osterminski

B-W2: Additive Manufacturing and 3D Printing

Chairs: Prof. J. Lange, Technical University of Darmstadt, Germany; Prof. M. Pagáč, VSB - Technical University of Ostrava, Czech Republic

10:30: Robot supported wire arc additive manufacturing and milling of steel columns, B. Waldschmitt, J. Lange, C. Borg Costanzi, U. Knaack, T. Engel, J. Müller
10:45: Global sensitivity analysis of sand-based binder jet 3D printed material, L. Del Giudice, M.F. Vassiliou, S. Marelli
11:00: Tribological analysis of selected 3D printing technologies in the context of building foundry models, T. Kozior, D. Gogolewski, P. Zmarzły
11:15: Characterization of 3D printed concrete beams after exposure to high temperature, O. Shkundalova, T. Molkens, M. Classen, B. Rossi
11:30: Experimental studies on the mechanical response for structural design of wire-and-arc additively manufactured stainless steel bars, V. Laghi, L. Arrè, M. Palermo, G. Gasparini, T. Trombetti
11:45: Dimensional accuracy of casting patterns produced by selected 3D printing technologies, P. Zmarzły, T. Kozior, D. Gogolewski
12:00: The effect of wind on 3D printed concrete interlayer bond strength based on machine learning algorithms, A. Cicione, P.J. Kruger, J.P. Mostert, R. Walls, G. Van Zijl
12:15: Influence of process irregularities in additively manufactured structures, M. Erven, J. Lange

B-W3: Numerical Analysis, Numerical Modelling & Crashworthiness

Chair: Prof. J. Napier, University of Pretoria, South Africa

13:30: Computational analysis of magma-driven dike and sill formation mechanisms, J.A.L. Napier, E. Detournay
13:45: Numerical analysis of a high-rise building near sensitive infrastructures, M. Seip, M. Hassan, S. Leppla
14:00: Accurate numerical integration in 3D meshless peridynamic models, U. Galvanetto, F. Scabbia, M. Zaccariotto
14:15: Phase field topology optimization of elasto-plastic contact problems with friction, A. Myśliński
14:30: Crashworthiness analysis of conical energy absorber filled with aluminum foam, M. Rogala, J. Gajewski
14:45: Numerical and experimental analysis of the triggering mechanism of the passive square thin-walled absorber, M. Rogala, J. Gajewski, R. Karpiński

B-W4: Additive Manufacturing and Industrial Processes

Chair: Prof. M. Pagáč, VSB - Technical University of Ostrava, Czech Republic

15:30: Tolerance-free assembly of heat-treated reinforced concrete modules with geometric deviations, J. Stindt, P. Forman, P. Mark
15:45: A case study of structural optimization for additive manufacturing, J. Hajnys, M. Pagac, J. Mesicek, P. Krpec
16:00: Tensile test of double-lap GFRP joint applying vacuum infusion wrapping, Y. Anan, M. Matsumura, H. Moriyama, S. Inoue
16:15: Multiscale analysis of surfaces made with additive technology in medical aspects, D. Gogolewski, T. Kozior, P. Zmarzły
16:30: Bio-inspired kinematics of reconfigurable linkage structures, N. Georgiou, M.C. Phocas

STREAM C

C-M2: Lightweight Structures, Spatial Structures and Form-Finding

Chair: Prof. S.D. Guest, University of Cambridge, UK

10:30: Principle of constant stress in analytical form-finding for durable structural design, W.J. Lewis (**Invited Paper**)
11:00: An individual shear deformation theory of beams with consideration of the Zhuravsky shear stress formula, K. Magnucki (**Invited Paper**)
11:30: Analysis of constructional errors of in-service spatial prestressed steel structures, A.L. Zhang, J. Wang, X. Zhao, Y.X. Zhang
11:45: Examples of application of principle of superposition and rules of symmetry in engineering design, J. Rębielak
12:00: Full-scale tests of a lightweight footbridge: The Folke Bernadotte Bridge, D. Colmenares, G. del Pozo, G. Costa, R. Karoumi, A. Andersson
12:15: Numerical analysis of new assembled cable dome ring truss connections, A.L. Zhang, M. Zou, Y.X. Zhang, G.H. Shangguan, J. Wang

C-M3: Shells, Spatial Structures and Form-Finding

Chair: Prof. S.D. Guest, University of Cambridge, UK

13:30: Extraordinary mechanics in slender structural surfaces, S. Adriaenssens (**Invited Paper**)
14:00: A numerical displacement-based approach for the structural analysis of cable nets, B. Frigo, A.P. Fantilli
14:15: Asymmetric multifocal egg-like shells with elastic adaptive frameworks, D. Kozlov, Y. Vaserchuk
14:30: Parametric study of the catenary dome under gravity load, R.A. Bradley, M. Gohnert
14:45: Analytical and numerical analysis of anchored flexible steel liquid storage tanks subjected to seismic loads considering soil-structure interaction, M.S. Pourbehi, J.A.v.B. Strasheim, M. Georgiadis

C-M4: Glass Structures I

Special Session SS15: Structural Applications of Glass. Organiser: Prof. Jan Belis, University of Ghent, Belgium

Chairs: Prof. J. Belis, University of Ghent, Belgium; Prof. B. Weller, Technical University of Dresden, Germany

15:30: Rotational stiffness and strength of a two-sided reinforced laminated glass beam-column joint prototype: Experimental investigation, M. Pejatovic, R. Caspeele, J. Belis
15:45: Structural bonding with hyperelastic adhesives: Material characterization, structural analysis and failure prediction, P.L. Rosendahl, F. Rheinschmidt, J. Schneider
16:00: In-plane loaded glass balustrades as structural members for balconies, J. Giese-Hinz, F. Nicklisch, B. Weller, M. Baitinger, H. Hoffmann, J. Reichert
16:15: Topologically optimized structural glass megaliths: Potential, challenges and guidelines for stretching the mass limits of structural cast glass, F. Oikonomopoulou, A.M. Koniari, W. Damen, D. Koopman, I.M. Stefanaki, T. Bristogianni
16:30: The strength of glass with digital printing, J. Wünsch, B. Weller, J. Wittwer, A. Rumpf
16:45: Experimental investigations on EVA interlayers in the regime of large deformations in the context of the examination of the residual load bearing capacity of LSG, M. Baric, A. Pauli, G. Siebert

17:00: Thermal loads in triple glazing: Experimental and numerical case study, P. Bukieda, B. Weller

C-T2: Progressive Collapse and Structural Robustness

Special Session SS27: Progressive Collapse and Design for Robustness. Organizers: Prof. Uwe Starossek, Hamburg University of Technology, Germany; Prof. Jose Adam, Polytechnic University of Valencia, Spain

Chairs: Prof. U. Starossek, Hamburg University of Technology, Germany; Prof. J.M. Adam, Polytechnic University of Valencia, Spain

10:30: Research on structural robustness through large-scale testing, J.M. Adam, M. Buitrago, N. Makoond (**Invited Paper**)
11:00: Experimental evaluation of composite floors under column loss scenarios, M. Hadjioannou, E.B. Williamson, M.D. Engelhardt
11:15: The role of infills modelling in progressive collapse capacity assessment of RC buildings: A case study, M. Scalvenzi, E. Brunesi, F. Parisi
11:30: Computational study on the progressive collapse of precast reinforced concrete structures, N. Makoond, M. Buitrago, J.M. Adam
11:45: Lumped plasticity approach for the robustness assessment of structures, T. Molkens
12:00: Progressive collapse resistant design of tall buildings under fire load, F. Fu
12:15: A multi-scale approach for quantifying the robustness of existing bridges, V. De Biagi, B. Chiaia, F. Kiakojouri
12:30: Numerical study of dynamic collapse resistance of an RC flat plate substructure under an interior column removal scenario, Z. Yang, H. Guan, Y. Li, X.Z. Lu

C-T3: Timber Structures and Timber Technology I

Chair: Prof. K. Holschemacher, Leipzig University of Applied Sciences, Germany

13:30: Recent developments in timber-concrete composite construction, K. Holschemacher (**Invited Paper**)
14:00: Reliability of statically indeterminate timber structures: Modelling approaches and sensitivity study, D. Caprio, R. Jockwer, M. Al-Emrani
14:15: Future perspectives about timber-hybrid systems: The role of connections, G. Di Nunzio, L. Corti, G. Muciaccia
14:30: Improving the modelling of tall timber buildings, O. Flamand, M. Manthey
14:45: High performance light timber shear walls and dissipative anchors for damage limitation of wooden buildings in seismic areas, V. Wilden, G. Balaskas, B. Hoffmeister, L. Rauber, B. Walter
15:00: Development of cross-laminated timber composite panels from C16 timber, E. McAllister, D. McPolin
15:15: Interpretation of collapse modalities for a timber roof truss, M. Acito, E. Magrinelli, C. Chesi, M.A. Parisi

C-T4: Glass Structures II

Special Session SS15: Structural Applications of Glass. Organiser: Prof. Jan Belis, University of Ghent, Belgium

Chairs: Prof. J. Belis, University of Ghent, Belgium; Dr. F. Oikonomopoulou, Technical University of Delft, Netherlands

15:30: Investigations on the concept of hybrid bonding in glass structures, D. Offereins, G. Siebert
15:45: Transparent smoke barriers, A. Haese, B. Siebert
16:00: Reinforced glass: Structural potential of cast glass beams with embedded metal reinforcement, T. Bristogianni, F. Oikonomopoulou

16:15: Influence of the interlayer core material in glass–plastic composite panels on performance characteristics according to the requirements for laminated safety glass, J. Hänig, B. Weller
16:30: Numerical simulation of the heat flow through laminated glass beams exposed to fire: A parametric study, M. Möckel, T. Juraschitz, C. Louter
16:45: Load analysis for the development of a bonded edge seal for fluid-filled insulating glazing, A. Joachim, B. Weller

C-W2: Timber Structures and Timber Technology II

Special Session SS21: Mechanics of Wood and Timber Structures. Organiser: Dr. Rostand Moutou Pitti, University of Clermont Auvergne, France

Chairs: Dr. R. Moutou Pitti, University of Clermont Auvergne, France; Prof. C. Roth, University of Pretoria, South Africa

10:30: Influence of initial crack width in Mode I fracture tests on timber and adhesive timber bonds, S.A. Rahman, M. Ashraf, M. Subhani, J. Reiner
10:45: Mechano-sorptive behaviour on crack propagation of notched beams of Okume, M. Asseko Ella, G. Goli, J. Gril, R. Moutou Pitti
11:00: Laminating effect in South African pine glue laminated timber beams, F.J. Pretorius, C. Roth
11:15: Influence of knots and density distribution on compressive strength of wooden foundation piles, G. Pagella, M. Mirra, G.J.P. Ravenshorst, J.W.G. van de Kuilen
11:30: Link between growth strategies and physical-mechanical properties of wood of tropical species from Gabon, E. Nkene Mezui, L. Brancheriau, D. Guibal, R. Moutou Pitti
11:45: The effect of wood microstructure on the mechanical properties of some selected tropical hardwood species used in construction, J.O. Akinyele, A.B. Folorunsho, U.T. Igba, P.O. Omotainse, J.O. Labiran
12:00: Creep tests on notched beams of silver fir wood (*Abies alba*), A. Bontemps, G. Godi, E. Fournely, J. Gril, R. Moutou Pitti

C-W3: Performance of Structures in Fire

Chair: Prof. A. Bouchair, University of Clermont Auvergne, France

13:30: Large-scale fire testing of an innovative cellular beam and composite flooring structural system, J. Claasen, R. Walls, A. Cicione
13:45: Experimental and numerical evaluation of various solutions for fire protection of steel structures, M.H. Nguyen, S.E. Ouldboukhitine, S. Durif, V. Saulnier, A. Bouchair
14:00: Effects of elevated temperatures on cold-formed stainless steel double shear bolted connections, Y. Cai, B. Young
14:15: Resistance of axially and eccentrically loaded steel column at high temperature: A simple expression, G. Somma
14:30: Performance of light gauge cold-formed steel flexural members subjected to non-uniform fire, R. Singh, A. Samanta

C-W4: Concrete-Filled Steel Tubes

Chairs: Prof. E.Y. Sayed-Ahmed, American University in Cairo, Egypt; Prof. M. Otieno, University of the Witwatersrand, South Africa

15:30: Investigation of CDP parameters and concrete confinement models for use in circular slender CFDST columns subjected to eccentric loading, A.A. Usongo, T.N. Haas
15:45: Evaluation of parameters which influence circular slender CFDST columns subjected to eccentric loading, A.A. Usongo, T.N. Haas

16:00: Stub concrete-filled double-skin circular tubes in compression, R. Mahlangu, M. Dundu
16:15: Evaluating the effect of load eccentricity on slender circular CFDST columns, J.P. Rust, T.N. Haas
16:30: Calibration and validation of slender circular CFDST columns subjected to eccentric loading, T.N. Haas, A.A. Usongo, J.A. Koen

STREAM D

D-M2: Buckling of Structures I

Chairs: Prof. L. Gardner, Imperial College London, UK; Prof. S. Shrivastava, McGill University, Canada

10:30: Harnessing instabilities within metamaterial structures, M.A. Wadee, A. Bekele, A.T.M. Phillips (**Invited Paper**)
11:00: Modelling thin-walled members by means of the dynamic approach within the Generalised Beam Theory (D-GBT), G. Ranzi (**Invited Paper**)
11:30: Lateral-torsional buckling of steel double-tee shape beams based on the decomposition of transverse load combinations, A.M. Barszcz, M.A. Gizejowski
11:45: Elastic shear buckling of beams with sinusoidal corrugated webs, L. Sebastiao, J. Papangelis
12:00: Flexural-torsional buckling of steel double-tee shape beam-columns with lateral-torsional discrete restraints, M.A. Gizejowski, A.M. Barszcz, P. Wiedro
12:15: Plastic bifurcation of rectangular plates with transverse shear effects: General theory and examples of uniaxially stressed plates, S. Shrivastava (**Invited Paper**)

D-M3: Buckling of Structures II

Chairs: Prof. L. Gardner, Imperial College London, UK; Prof. S. Shrivastava, McGill University, Canada

13:30: On energy based flexural-torsional buckling criteria of double-tee shape elastic thin-walled members, M.A. Gizejowski (**Invited Paper**)
14:00: Plastic buckling of fixed-roof oil storage tanks under blast loads, L.A. Godoy, M.P. Ameijeiras (**Invited Paper**)
14:30: Machine learning optimization strategy for the inelastic buckling modelling of un-corroded and corroded reinforcing plain bars, F. Pugliese, L. Di Sarno
14:45: Buckling check under biaxial loading considering different launching bearings and eccentric load introduction, N. Maier, M. Mensinger, J. Ndogmo
15:00: Influence of symmetry on the buckling behaviour of plane frames, C. Kaluba, A. Zingoni

D-M4: Steel Structures I

Chair: Prof. M.A. Gizejowski, Warsaw University of Technology, Poland

15:30: Numerical simulation and design of steel equal-leg angle section beams, B. Behzadi-Sofiani, L. Gardner, M.A. Wadee
15:45: Numerical analysis on semi-rigid pin joint for modular assembled steel reticulated shell, A.L. Zhang, C. Li
16:00: Numerical modelling for connections of staggered single channel rafters in double-bay cold-formed steel portal frames, J. Kafuko, M. Dundu
16:15: Full-scale tests of industrial steel storage pallet racks, N. Baldassino, M. Bernardi, R. Zandonini, A. di Gioia

16:30: Experimental tests on the rack-to-spine bracing joints of high-rise steel storage racks, Z. Huang, X. Zhao, K.S. Sivakumaran
16:45: Experimental investigation of the rack-to-bracing joints between the high-rise steel storage rack frames and the independent bracing towers, Z. Huang, X. Zhao, K.S. Sivakumaran

D-T2: High Strength Steel & High Performance Steel I

Special Session SS18: High Strength Steel in Research, Construction and Application. Organisers: Prof. Richard Stroetmann, Technical Univ. of Dresden, Germany; Prof. Guo-Qiang Li, Tongji University, China
Chairs: Prof. R. Stroetmann, Technical University of Dresden, Germany; Prof. G.Q. Li, Tongji University, China

10:30: A 3D constitutive model of high-strength constructional steels with ductile fracture, G.Q. Li, Y.B. Wang, Y.Z. Wang, L.T. Hai, W.Y. Cai (**Invited Paper**)
11:00: Investigation of the effects of an over-elastic preload on the load-bearing behaviour of high-strength bolt and nut assemblies, J. Reinheimer, J. Lange
11:15: Bending effects on the fatigue strength of non-load-carrying transverse attachment joints made of ultra-high-strength steel, A. Ahola, T. Björk
11:30: Mechanical properties of thin-walled high-strength-steel cold-formed circular hollow sections for crane and scaffolding construction, D. Gubetini, M. Mensinger
11:45: A basic study on the evaluation of residual axial force of high strength bolts for steel bridges constructed in the same environment at different ages, T. Iida, K. Sugiura, T. Yamaguchi, Y. Kitane
12:00: Influence of high strength steel on the fatigue of welded details, H. Bartsch, M. Feldmann
12:15: Design methodology of grade 12.9 bolts considering hydrogen-induced delayed fracture, Y.B. Wang, Z. Sun, B. Tha, G.Q. Li, X.L. Zhao
12:30: Behaviour of cold-formed high strength steel tubular X-joints with circular braces and rectangular chords, M. Pandey, B. Young

D-T3: High Strength Steel & High Performance Steel II

Special Session SS18: High Strength Steel in Research, Construction and Application. Organisers: Prof. Richard Stroetmann, Technical Univ. of Dresden, Germany; Prof. Guo-Qiang Li, Tongji University, China
Chairs: Prof. R. Stroetmann, Technical University of Dresden, Germany; Prof. G.Q. Li, Tongji University, China

13:30: Welded connections of high-strength steels, R. Stroetmann, T. Kästner, B. Rust (**Invited Paper**)
14:00: Influence of residual stresses on innovative composite column sections using high strength steel, R. Röß, M. Schäfers, M. Mensinger
14:15: Experimental and numerical study of butt welded joints made of high strength steel, R. Yan, H. El Bamby, M. Veljkovic
14:30: Study on mechanical properties of high-strength steel butt-welded joints, W.Y. Cai, Y.B. Wang, G.Q. Li
14:45: Experimental investigation on cold-formed high strength steel tubular T-joints after fire exposures, M. Pandey, B. Young

D-T4: Steel Structures II

Chair: Prof. M. Mensinger, Technical University of Munich, Germany

15:30: Fatigue resistance of steel arch bridge hanger connection plates due to transverse welding, P. Van Bogaert (**Invited Paper**)

16:00: Issues related to the assessment of an existing reinforcement of a lattice telecommunication tower, J. Szafran, J. Telega
16:15: 3D models of clad steel structures: Assumptions and validation, M.J. Roberts, J.M. Davies
16:30: Shear capacity of the Truedek steel decking system in the formwork, N. Singh, O. Mirza, M. Hosseini, A. Wheeler, D. Allan
16:45: Design for de-construction of lightweight infill wall systems, S. Kitayama, O. Iuorio

D-W2: Steel Structures III

Chairs: Prof. M.A. Gizejowski, Warsaw University of Technology, Poland; Prof. E. Williamson, University of Texas at Austin, USA

10:30: Machine learning approach for stress analyses of steel members affected by elastic shear lag**,** H. Fritz, M. Kraus
10:45: Influence of web openings on the load bearing behavior of steel beams, F. Eyben, S. Schaffrath, M. Feldmann
11:00: Simplified approach to calculate welding effect for multi-layer welds of I-girders, T. Krausche, H. Pasternak, J. Wang, Z. Li, B. Launert
11:15: Static strength capacity of single-sided fillet welds, T. Skriko, A. Ahola, K. Lipiäinen, T. Björk
11:30: Microstructure and corrosion resistance of dissimilar welded joints, B. Verhoeven, R. Dewil, G. Ferraz, B. Karabulut, S. Sun, B. Rossi
11:45: Relating stress concentrations in triangular steel bridge piers to simple beam models, P. Van Bogaert, G. Van Staen, H. De Backer
12:00: Bending capacity of single and double-sided welded I-section girders: Part 1: Experimental investigations, J. Wang, M. Euler, H. Pasternak, Z. Li, T. Krausche, B. Launert
12:15: Bending capacity of single and double-sided welded I-section girders: Part 2: Simplified welding simulation and buckling analysis, Z. Li, H. Pasternak, J. Wang, B. Launert, T. Krausche

D-W3: Steel Structures IV: Cold-Formed Members

Chairs: Dr. J. Qureshi, University of East London, UK; Prof. T. Haas, University of Stellenbosch, South Africa

13:30: Tests of cold-formed steel built-up open section beam-columns subjected to unequal end moments, Q.Y. Li, B. Young (**Invited Paper**)
14:00: Experimental investigation of distortional buckling of single channels restrained by angle cleats, G.M. Bukasa, M. Dundu
14:15: Optimum design of hat cold-formed steel members using direct strength method, M.H. Khashaba, I.M. El-Aghoury, A.A. El-Serwi
14:30: Numerical modelling of gusseted internal eaves connection of double-bay cold-formed steel portal frames using single channels, J. Kafuko, M. Dundu
14:45: Numerical study of distortional buckling of single channels restrained by angle cleats, G.M. Bukasa, M. Dundu

D-W4: Steel Structures V

Chair: Prof. M. Mensinger, Technical University of Munich, Germany

15:30: Behaviour of steel end-plate bolted beam-to-column joints, J. Qureshi, S. Shrestha
15:45: Experimental study on shallow H-shaped steel column under combined loading condition, S. Nakatsuka, A. Sato
16:00: Behaviour and recommended design method for laterally unsupported monosymmetric steel I-section beams, S. Suman, A. Samanta

16:15: Steel beam upstands as a strengthening approach for hot-rolled I-shaped sections, K. Mudenda, A. Zingoni

STREAM E

E-M2: Concrete Structures I

Special Session SS05: Mechanics of Reinforced Concrete and Construction Materials. Organiser: Prof. Maria Anna Polak, University of Waterloo, Canada

Chair: Prof. M.A. Polak, University of Waterloo, Canada

10:30: Using nonlinear finite element modeling for punching shear design of concrete slabs, P.M. Beaulieu, G.J. Milligan, M.A. Polak (**Invited Paper**)
11:00: Design of precast concrete framing systems against disproportionate collapse using component-based methods, K. Riedel, R. Vollum, B. Izzuddin, G. Rust, D. Scott
11:15: Shear capacity of concrete elements with reinforcement made of steel and FRP, S. Görtz, R. Haack
11:30: Estimating post-punching capacity and progressive collapse resistance of RC flat plates using shell-based FEA, A.B. Bahnamiri, T.D. Hrynyk, C.Y. Goh
11:45: Live load test for pedestrian bridge constructed with innovative concrete bridging system, H.H. Alghazali, J.J. Myers, K.E. Bloch
12:00: Modelling temperature and stress development in large concrete elements under sequential construction conditions: Experience with the Msikaba Bridge foundations, Y. Ballim, G. Harli
12:15: Theoretical analysis and experimental test results calibrated from concrete beams, G. Sossou

E-M3: Concrete Structures II

Chairs: Prof. A. Belarbi, University of Houston, USA; Dr. H.H. Abbas, Al-Azhar University, Egypt

13:30: Semi-probabilistic nonlinear assessment of post-tensioned concrete bridge made of KT-24 girders, B. Šplíchal, D. Lehký, J. Doležel
13:45: Punching shear behaviour of continuous flat slabs: A new test setup incorporating system influences, M. Kalus, J. Ungermann, J. Hegger
14:00: Long-term deformation of segmented prestress bridges under harsh weather conditions: Case study of Exit 23 Interchange at Riyadh Ring Road, H.H. Abbas, M.M. Hassan
14:15: The continuous spalling of reinforced concrete structures of the three bridges on the Lagos lagoon in Nigeria, U.T. Igba, J.O. Akinyele, A. Adetiloye, J.O. Labiran
14:30: Investigations on shear transfer by aggregate interlock with unique test setup (TorAx), S. Bosbach, M. Schmidt, H. Becks, M. Claßen, J. Hegger

E-M4: Concrete Structures III

Chair: Prof. R. Kotynia, Lodz University of Technology, Poland

15:30: Experimental assessment of crack width estimations in international design codes, I. Ridley, M. Shehzad, J. Forth, N. Nikitas, A. Elwakeel, K. Elkhoury, R. Vollum, B. Izzuddin
15:45: Characterization of major reinforcing bars for concrete works in Botswana construction industry, A.P. Adewuyi, G.B. Eric, O.J. Kanyeto
16:00: RC flooring system recycling plastic bottles: New innovative RC waffle slab, C. El Mankabady, N. Salama, H. Tolba, K. Nassar, M.N. Abouzeid, E.Y. Sayed-Ahmed
16:15: Shear capacity of rib and block slab systems, Y. Essopjee
16:30: Behaviour of reinforced concrete beams enhanced with polymer modified ferrocement, N.F.O. Evbuomwan

E-T2: High Strength Concrete & High Performance Concrete I

Special Session SS06: Fatigue of Concrete in an Experimental-Virtual-Lab. Organisers: Prof. S. Anders, Bergische Universität Wuppertal, Germany; Prof. L. Lohaus, Leibniz Universität Hannover, Germany; Prof. J. Schröder, University of Duisburg-Essen, Germany

Chairs: Prof. J. Schröder, University of Duisburg-Essen, Germany; Prof. G. Meschke, Ruhr University Bochum, Germany

10:30: Phase-field modeling for damage in high performance concrete at low cycle fatigue, J. Schröder, M. Pise, D. Brands, G. Gebuhr, S. Anders (**Invited Paper**)
11:00: Macroscopic model based on application of representative volume element for steel fiber reinforced high performance concrete, M. Pise, D. Brands, J. Schröder, G. Gebuhr, S. Anders
11:15: Homogenisation of the material behaviour of UHPFRC under tension, L. Gietz, J.P. Lanwer, D. Dinkler, U. Kowalsky, M. Empelmann
11:30: Numerical and experimental analysis of fatigue-induced changes in ultra-high performance concrete, S. Rybczynski, G. Schaan, M. Dosta, M. Ritter, F. Schmidt-Döhl
11:45: Damage development of steel fibre reinforced high performance concrete in high-cycle fatigue tests, G. Gebuhr, M. Pise, S. Anders, D. Brands, J. Schröder
12:00: Fatigue behavior and crack opening tests under tensile stress on HPSFRC: Experimental and numerical investigations, N. Schäfer, V. Gudžulić, R. Breitenbücher, G. Meschke
12:15: Influence of concrete compressive strength on fatigue behaviour under cyclic compressive loading, M. Markert, M. Deutscher

E-T3: High Strength Concrete & High Performance Concrete II

Includes Contributions to Special Session SS06

Chairs: Prof. B. Middendorf, University of Kassel, Germany; Prof. G. Meschke, Ruhr University Bochum, Germany

13:30: Potential of shape memory alloys in fiber reinforced high performance concrete, B. Middendorf, M. Schleiting, E. Fehling (**Invited Paper**)
14:00: Influence of the concrete moisture content on the strain development due to cyclic loading, M. Markert, V. Birtel, H. Garrecht
14:15: Influence of moisture content on strain development of concrete subjected to compressive creep and cyclic loading, B. Kern, N. Oneschkow, M. Haist, L. Lohaus
14:30: Influence of loading frequency on the compressive fatigue behaviour of high-strength concrete with different moisture contents, M.A. Ali, N. Oneschkow, L. Lohaus, M. Haist
14:45: Behavior of coupled walls with high performance fiber reinforced concrete coupling beams, M. Abdelhafeez, H. Salem

E-T4: Structural Applications of FRP Composites I

Special Session SS08: Structural Use of FRP Composites. Organisers: Prof. Lawrence Bank, Georgia Institute of Technology, USA; Prof. John Myers, Missouri University of Science and Technology, USA; Prof. Brahim Benmokrane, University of Sherbrooke, Canada

Chairs: Prof. L.C. Bank, Georgia Institute of Technology, USA; Prof. J. Myers, Missouri University of Science and Technology, USA; Prof. B. Benmokrane, University of Sherbrooke, Canada

15:30: State of the art in research and field applications of post-tensioned structures strengthened with prestressed composites, R. Kotynia, M. Staśkiewicz
15:45: Reinforcement made of basalt fiber reinforced polymer (BFRP): Load-bearing capacity, durability and applications, S. Görtz, K. Lengert, D. Glomb, B. Wolf, A. Kustermann, C. Dauberschmidt

16:00: Onsite manufacturing and applications of FRP pipes, M. Ehsani
16:15: Performance of self-drilling screw connections for structural pultruded fibre reinforced polymer composites, Z. Cai, Y. Bai, L.C. Bank, C. Qiu, X.L. Zhao
16:30: The axial behavior of the low and extremely low strength concrete confined with large-rupture-strain PET-FRPs made of production wastes, A.G. Genc, O.F. Eskicumali, N. Aslan, T. Ergin, U. Alparslan, M. Ispir, A. Ilki
16:45: Properties of a 37m long FRP wind turbine blade after 11 years in service, A.A. Alshannaq, J.A. Respert, L.C. Bank, T.R. Gentry, D.W. Scott

E-W2: Structural Applications of FRP Composites II

Special Session SS08: Structural Use of FRP Composites. Organisers: Prof. Lawrence Bank, Georgia Institute of Technology, USA; Prof. John Myers, Missouri University of Science and Technology, USA; Prof. Brahim Benmokrane, University of Sherbrooke, Canada

Chairs: Prof. L.C. Bank, Georgia Institute of Technology, USA; Prof. J. Myers, Missouri University of Science and Technology, USA; Prof. B. Benmokrane, University of Sherbrooke, Canada

10:30: Case studies of repurposing FRP wind blades for second-life new infrastructure, L.C. Bank, T.R. Gentry, T. Al-Haddad, A. Alshannaq, Z. Zhang, M. Bermek, Y. Henao, A. McDonald, S. Li, A. Poff, J. Respert, C. Woodham, A. Nagle, P. Leahy, K. Ruane, A. Huynh, M. Soutsos, J. McKinley, E. Delaney, C. Graham (**Invited Paper**)
11:00: Evaluation of using FRP bond equations in alternative types of advanced composite externally bonded to concrete, Z. Al-Jaberi, R. Mahdi, J.J. Myers
11:15: Prediction on stress-strain behavior of FRP-confined concrete with passive confinement-based 3D constitutive model, J.F. Jiang, P.D. Li, B.B. Li
11:30: Development and testing of new precast concrete tunnel segments reinforced with GFRP bars and ties, S.M. Hosseini, S. Mousa, H.M. Mohamed, B. Benmokrane
11:45: An experimental study on the compression behavior of CFRP-jacketed plastered RC columns, M.N. Yavuzer, S. Kolemenoglu, C. Balci, M. Ispir, A. Ilki
12:00: Parametric study of CFFT systems for small-scale wind turbine towers, Y. Gong, M. Noël
12:15: Estimating shear strengths of GFRP reinforced concrete deep beams with indeterminate strut-and-tie method, S. Liu, M.A. Polak
12:30: Bolted and hybrid beam-column joints between I-shaped FRP profiles, J. Qureshi, Y. Nadir, S.K. John

E-W3: Structural Applications of FRP Composites III

Special Session SS08: Structural Use of FRP Composites. Organisers: Prof. Lawrence Bank, Georgia Institute of Technology, USA; Prof. John Myers, Missouri University of Science and Technology, USA; Prof. Brahim Benmokrane, University of Sherbrooke, Canada

Chairs: Prof. L.C. Bank, Georgia Institute of Technology, USA; Prof. J. Myers, Missouri University of Science and Technology, USA; Prof. B. Benmokrane, University of Sherbrooke, Canada

13:30: Standardization, guide development and long-term durability of fiber reinforced polymers (FRP): In situ field results from FRP RC bridge decks after 15+ years of service exposure, J.J. Myers, A.F. Al-Khafaji
13:45: Sustainable and corrosion-free bridge structures, A. Belarbi, D. Vecchio, D. Stefaniuk
14:00: Flexural characteristics of bio-based sandwich beams made of paper honeycomb cores and flax FRP skins, Y. Fu, P. Sadeghian
14:15: Behaviour of NSM FRP flexurally-strengthened RC beams with embedded FRP anchors, Y. Ke, S.S. Zhang, X.F. Nie
14:30: Unique FRP solutions for structural repair of piles, seawalls and decks, M. Ehsani
14:45: Strength behaviour of fibre reinforced polymer concrete beams under flexural loading, J.T. Senosha, S.D. Ngidi

15:00: Sustainable sandwich composites made of recycled plastics, R.A. Kassab, P. Sadeghian

E-W4: Historical Structures, Monuments, Preservation

Chairs: Prof. G. Brando, University G. D'Annunzio of Chieti-Pescara, Italy; Prof. M. Ehsani, Univ. of Arizona & QuakeWrap, USA

15:30: Heritage protection and safety requirements: A difficult relationship, U. Quapp, K. Holschemacher
15:45: Reconnaissance survey of historic monumental unreinforced masonry building by visual inspection: A case study of senate hall building of Allahabad University, India, A. Kumar, K. Pallav
16:00: On the characterization of materials and masonry walls of historical buildings: use of optical system to obtain displacement maps in double-flat jack tests, M. Acito, E. Magrinelli, C. Tiraboschi, M. Cucchi
16:15: Seismic assessment of a colonial adobe building in Cusco, Peru, A. Tancredi, G. Cocco, E. Spacone, G. Brando
16:30: Lifetime assessment for historical cast steel bridge bearings, D. Siebert, M. Mensinger

STREAM F

F-M2: Bridge Maintenance I

Special Session SS12: Advancement of Technologies for Maintenance of Bridges. Organisers: Prof. Chul-Woo Kim, Kyoto University, Japan; Prof. Kunitomo Sugiura, Kyoto University, Japan
Chairs: Prof. C.W. Kim, Kyoto University, Japan; Prof. K. Sugiura, Kyoto University, Japan

10:30: Development of vibration-based early scour warning system for railway bridge piers, C.W. Kim, J. Qi, D. Kawabe (**Invited Paper**)
11:00: Vibration-based Bayesian anomaly detection of PC bridges, D. Kawabe, C.W. Kim, K. Takemura, K. Takase
11:15: Vibration-based structural health monitoring of bridges based on a new unsupervised machine learning technique under varying environmental conditions, M. Salar, A. Entezami, H. Sarmadi, B. Behkamal, C. De Michele, L. Martinelli
11:30: Mechanical properties of stainless steel coatings formed by build-up spraying, E. Horisawa, K. Sugiura, Y. Kitane, Y. Goi, T. Tanimoto, M. Matsumura
11:45: Assessment on impact response analysis by chord member fracture of steel truss bridge, H. Nagatani, D. Yoshimoto, K. Hashimoto, Y. Kitane, K. Sugiura
12:00: Fatigue damage in thick GFRP laminate through the vibration-based bending fatigue experiment, A. Sato, Y. Kitane, Y. Goi, K. Sugiura
12:15: Simulation of many acceleration time histories with causality from an observed earthquake motion: Modeling of real part and reproduction of imaginary part by Hilbert transform, T. Sato

F-M3: Bridge Maintenance II

Special Session SS12: Advancement of Technologies for Maintenance of Bridges. Organisers: Prof. Chul-Woo Kim, Kyoto University, Japan; Prof. Kunitomo Sugiura, Kyoto University, Japan
Chairs: Prof. C.W. Kim, Kyoto University, Japan; Prof. K. Sugiura, Kyoto University, Japan

13:30: Application development of distributed fibre optic sensors for monitoring existing bridges, B. Novák, F. Stein, A. Dudonu, J. Reinhard
13:45: Prompt modal identification with quantified uncertainty of modal properties, Y. Goi
14:00: Compression strength of aged built-up column with vanished lacing bars, T. Miyoshi, T. Nakakita, K. Iwatsubo, T. Takai, K. Tamada

14:15: Fundamental study on crack detection method for steel members by thermal image processing, S. Watanabe, Y. Goi, Y. Kitane, K. Takase, K. Sugiura
14:30: Deflection condition monitoring of a steel bridge via remote sensing techniques, M.S. Miah, W. Lienhart
14:45: Plastic strain localization behavior of corroded steel plate under tensile loading, Y. Kitane, N.K. Gathimba, K. Sugiura

F-M4: Structural Health Monitoring & Damage Detection I

Chairs: Prof. M.P. Limongelli, Politecnico di Milano, Italy; Prof. G. De Roeck, Catholic University of Leuven, Belgium

15:30: Structural health monitoring in civil engineering: Status and trends, G. De Roeck, D. Anastasopoulos, E. Reynders (**Invited Paper**)
16:00: Bridge collapse prediction by small displacement data from satellite images under long-term monitoring, A. Entezami, C. De Michele, A.N. Arslan
16:15: An embedded physics-based modeling concept for wireless structural health monitoring, K. Dragos, K. Smarsly
16:30: Damage evaluation and tracking using kriging approaches on wave-guide dispersion curves, O.A. Bareille, L. Nechak, M. Ichchou, A. Zine
16:45: Wavelet-based transmissibility for structural damage detection, K. Dziedziech, K. Mendrok, T. Uhl, W.J. Staszewski
17:00: Investigation of modulation transfer due to nonlinear shear wave interaction with local source: Numerical and theoretical approach, R. Radecki, A. Ziaja-Sujdak, M. Osika, W.J. Staszewski

F-T2: Structural Health Monitoring & Damage Detection II

Chairs: Prof. G. De Roeck, Catholic University of Leuven, Belgium; Prof. M.P. Limongelli, Politecnico di Milano, Italy

10:30: Explainable framework for Lamb wave-based damage diagnosis, L. Lomazzi, M. Giglio, F. Cadini
10:45: Applying automatic damage classification during digital inspection of structures, J. Flotzinger, P.J. Rösch, F. Deuser, T. Braml, S. Reim, B. Maradni
11:00: Evaluation of changes in flexural rigidity of cracked concrete railway bridges under high-speed train passages, K. Matsuoka
11:15: Real-time health monitoring of civil structures by online hybrid learning techniques using remote sensing and small displacement data, A. Entezami, C. De Michele, A.N. Arslan
11:30: Measurement and simulation of pipeline attached to bridge for vibration-based SHM, D. Kobayashi, T. Nakanishi, Y. Sakurada, A. Aratake
11:45: Permanent tunnel lining monitoring system for the purpose of further design optimization, M. Jonáš, J. Zatloukal
12:00: Sustainable structural health monitoring using e-waste and recycled materials, P. Peralta, K. Smarsly
12:15: On the data-driven damage detection of offshore structures using statistical and clustering techniques under various uncertainty sources: An experimental study, M. Salar, A. Entezami, H. Sarmadi, C. De Michele, L. Martinelli

F-T3: Damage Identification, Structural Assessment & Corrosion

Chairs: Prof. S. Caddemi, University of Catania, Italy; Prof. W.J. Staszewski, AGH University of Science & Technology, Poland

13:30: Crack intensity closed form solutions by frequency measurements on damaged beams, S. Caddemi, I. Caliò, F. Cannizzaro, N. Impollonia

13:45: Condition rating for maintenance of existing reinforced concrete bridges in Soweto (South Africa), R.K. Maphosa, J. Mahachi, S.O. Ekolu
14:00: A computational procedure interacting with the Italian CARTIS online database to derive residential building portfolios for large scale seismic assessments, A. Basaglia, G. Brando, G. Cianchino, G. Cocco, D. Rapone, M. Terrenzi, E. Spacone
14:15: Structural damage identification using optimization-based FE model updating, K. Lamperová, D. Lehký, O. Slowik
14:30: The implications of climate change effects on the response parameters of concrete arch dams with respect to anomaly detection, T. Tshireletso, P. Moyo
14:45: Corrosion of fasteners in concrete: Literature review and discussion of current test methods, M. Cervio, G. Muciaccia
15:00: Effect of 2-directional chloride ingress on concrete resistivity and corrosion rate of steel bars at orthogonal edges, Z.G. Zakka, M. Otieno

F-T4: Construction Technology & Construction Projects
Chairs: Prof. M. Kapelko, Wroclaw University of Economics and Business, Poland; Prof. J. Mahachi, University of Johannesburg, South Africa

15:30: Full-scale experiments on hybrid tunnel lining segments, D.N. Petraroia, P. Mark
15:45: Environmental inefficiency of the world construction industry, M. Kapelko
16:00: Natural language processing as work support in project tendering, L. Cusumano, R. Rempling, R. Jockwer, R. Saraiva, M. Granath, N. Olsson, S. Okazawa
16:15: Rehabilitation applications of roadway structures, H.H. Abbas, M.M. Hassan

F-W2: Masonry Structures; Repair, Strengthening & Retrofitting
Chair: Dr. N. Mojsilovic, ETH Zürich, Switzerland

10:30: Strengthening of existing infrastructure with concrete screws as post-installed reinforcement, J. Feix, J. Lechner (**Invited Paper**)
11:00: Intermediate isolation system for the seismic retrofit of existing masonry buildings, D. Faiella, M. Argenziano, G. Brandonisio, F. Esposito, E. Mele
11:15: A seismic retrofitting design approach for activating dissipative behaviour of timber diaphragms in existing unreinforced masonry buildings, M. Mirra, G. Ravenshorst
11:30: Analytical formulation for plain and retrofitted masonry wall under out-of-plane loading, J.A. Dauda, O. Iuorio, F.P. Portioli
11:45: Structural behaviour of masonry walls with soft-layers: An overview of experimental work, N. Mojsilović
12:00: Investigating the causes, impact and repair methods of popping bricks in house construction, K. Nongwane, S.A. Alabi, J. Mahachi
12:15: Experimental investigation of the influence of embedment depth on the sustained load performance of adhesive anchors, A.C.O. Vera, S. Sartipi, W. Botte, R. Wan-Wendner
12:30: The review of diagonal compression tests of URM panels strengthened with NSM steel bars, S.D. Ngidi

F-W3: Construction Materials I
Chair: Prof. R. Wan-Wendner, University of Ghent, Belgium

13:30: Improvement of mechanical performance of cement-based composites using a new type of low-cost low-energy demand graphene, T.D. Nguyen, M. Su, M. Watson
13:45: Relationship between flexural strength and compressive strength in concrete and ice, A.P. Fantilli, B. Frigo, F.M. Dehkordi

14:00: Comparison and statistical evaluation of Marshall stability and stiffness modulus for asphalt mixtures, J. Valentin, P. Vacková, M. Belhaj
14:15: Using recycled concrete aggregate from bombed building in new concrete, S. Alaud, N.A. Droughi, S. Alaud
14:30: Using waste from paint manufacturing in concrete, H. Muller, R. Combrinck
14:45: Considerations regarding the toxicity of construction and building materials, F. Pacheco-Torgal

F-W4: Construction Materials II

Chairs: Prof. R. Combrinck, University of Stellenbosch, South Africa; Prof. J.O. Akinyele, Federal University of Agriculture, Nigeria

15:30: Fire performance of metakolin concrete and mortar blends using Nigerian kaolinite clays, J.O. Labiran, U.T. Igba, B.U. Ezea, J.O. Akinyele
15:45: Rheological and strength characterisation of limestone calcined clay cement 3D printed concrete, K.A. Ibrahim, G.P.A.G. van Zijl, A.J. Babafemi
16:00: Fresh properties and strength evolution of slag modified fibre-reinforced metakaolin-based geopolymer composite for 3D concrete printing application, M.B. Jaji, G.P.A.G Van Zijl, A.J. Babafemi
16:15: Expression for calculating the compressive strength of concrete containing rice husk ash, G. Somma
16:30: Compatibility issues between dehydrated calcium sulphate cement and plasticizer/superplasticizer, J.M.H. Bessinger, M. Meyer, R. Combrink

END