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TUESDAY, JULY 12, 2022

Welcome from ACI Global Moderators Antonio Nanni and Kari Yuers

9:00-10:00 PM Baghdad Time / 2:00-3:00 PM Detroit Time
Co-Host Organization: ACI Iraq Chapter

12:00-1:00 PM Hermosillo Time / 3:00-4:00 PM Detroit Time
Co-Host Organization: ACI Northwest Mexico Chapter

3:00-4:00 PM Bogotá Time / 4:00-5:00 PM Detroit Time
Co-Host Organization: ACI Republic of Colombia Chapter

6:00-7:00 PM Sao Paulo Time / 5:00-6:00 PM Detroit Time
Co-Host Organization: IBRACON - Instituto Brasileiro do Concreto

5:00-6:00 PM Quito Time / 6:00-7:00 PM Detroit Time
Co-Host Organization: ACI Ecuador Chapter

6:00-7:00 PM Mérida Time / 7:00-8:00 PM Detroit Time
Co-Host Organization: ACI Southeast Mexico Chapter

6:00-7:00 PM Guatemala City Time / 8:00-9:00 PM Detroit Time
Co-Host Organizations: ACI Guatemala Chapter & Instituto del Cemento y del Concreto de Guatemala (ICCG)

WEDNESDAY, JULY 13, 2022

1:00-2:00 PM Auckland Time / 9:00-10:00 PM Detroit Time
Co-Host Organization: Concrete New Zealand Learned Society

12:00-1:00 PM Sydney Time / 10:00-11:00 PM Detroit Time
Co-Host Organization: Concrete Institute of Australia

12:00-1:00 PM Tokyo Time / 11:00 PM-12:00 AM Detroit Time
Co-Host Organization: Japan Concrete Institute (JCI)

1:00 AM-12:00 PM Bangkok Time / 12:00-1:00 AM Detroit Time
Co-Host Organization: Thailand Concrete Association (TCA)

2:00-3:00 PM Seoul Time / 1:00-2:00 AM Detroit Time
Co-Host Organization: Korea Concrete Institute (KCI)

2:00-3:00 PM Singapore Time / 2:00-3:00 AM Detroit Time
Co-Host Organization: ACI Singapore Chapter

10:00-11:00 AM Beirut Time / 3:00-4:00 AM Detroit Time
Co-Host Organization: ACI Lebanon Chapter

10:00-11:00 AM Paris Time / 4:00-5:00 AM Detroit Time
Co-Host Organization: ACI Paris Chapter

12:00-1:00 PM Erbil Time / 5:00-6:00 AM Detroit Time
Co-Host Organization: ACI Kurdistan Chapter

11:00 AM-12:00 PM London Time / 6:00-7:00 AM Detroit Time
Co-Host Organization: The Institute of Concrete Technology (ICT)

4:30-5:30 PM Mumbai Time / 7:00-8:00 AM Detroit Time
Co-Host Organization: ACI India Chapter

2:00-3:00 PM Rome Time / 8:00-9:00 AM Detroit Time
Co-Host Organization: ACI Italy Chapter

3:00-4:00 PM Lausanne Time / 9:00-10:00 AM Detroit Time
Co-Host Organization: Fédération internationale du béton (fib)

4:00-5:00 PM Warsaw Time / 10:00-11:00 AM Detroit Time
Co-Host Organization: Committee of Civil Engineering of the Polish Academy of Sciences (CCE PAS)

5:00-6:00 PM Oslo Time / 11:00 AM-12:00 PM Detroit Time
Co-Host Organization: Norwegian Concrete Association (NCA)

6:00-7:00 PM Madrid Time / 12:00-1:00 PM Detroit Time
Co-Host Organization: Asociación Española de Ingeniería Estructural (ACHE)

1:00-2:00 PM Santiago Time / 1:00-2:00 PM Detroit Time
Co-Host Organization: Instituto del Cemento y del Hormigón de Chile (ICH)

Closing remarks from ACI Global Moderators Antonio Nanni and Kari Yuers
Hosted by the American Concrete Institute • July 12-13, 2022

ACI Global Moderators

Antonio Nanni, ACI Vice President, University of Miami

Kari Yuers, President & CEO, Kryton International Inc.
The ACI Iraq Chapter was founded in 2013, when 16 Iraqi ACI members signed a petition to establish it. The chapter aimed to address the needs of rebuilding Iraq’s skills and knowledge base in concrete research, design, manufacturing, and construction sectors. The chapter’s activities were designed to help meet Iraqi engineers’ technical and educational needs and introduce them to crucial new technologies through access to the vast resources of ACI. Another major aim of the proposed ACI chapter was to bring together the various individuals and groups in Iraq who are interested in developing their skills in concrete design and technology through discussions and dissemination of technical and educational information.

**Local Moderator: Dr. Ali N. Attiyah**

Dr. Ali Naji Attiyah graduated from the Civil Engineering Department at the University of Baghdad, Baghdad, Iraq, in 1986, and completed his MSc and PhD in structural engineering from the same university in 1992 and 2000, respectively. After graduation, he worked in both academic and professional fields and had good experience in structural design of concrete buildings and other structures through his work in one of the largest bureaus in Iraq for engineering consultancy, Al-Idrisi Bureau for Engineering and Architectural Consultancy. During this period, he participated in the post-war construction of buildings in Iraq after the war in 1991. At the University of Kufa, Iraq, Dr. Attiyah was the Manager of the engineering consulting office, and through this mission, was the Director of many important projects. In addition, he taught different courses dealing with concrete, such as concrete technology and concrete design. He succeeded with his colleagues from other Iraqi universities in establishing the ACI Iraq Chapter, where he was elected in September 2013 as the first Executive Director of the chapter.

**1st Speaker: Professor Haitham H. Muteb**

Dr. Haitham Hassan Muteb is a Professor in structural engineering at the University of Babylon College of Engineering, Hillah, Iraq. He received his BSc in civil engineering from the University of Mosul, Mosul, Iraq, in 1989; his MSc in civil engineering (structures) from Al-Nahrain University, Baghdad, Iraq; and his PhD in civil engineering (structures) from the University of Baghdad. He supervised 36 MSc students and 16 PhD students. He worked as a structural designer (steel and concrete structures) in Iraq using computer software aiding structural design and drafting (ABAQUS, ANSYS, ETABS, SAFE, SAP2000, Tekla, STAAD.Pro, Prokon, Revit, 3ds Max, and AutoCAD). Dr. Muteb also worked as Director of Scientific Affairs and Graduate Studies at the University of Babylon College of Engineering. He was the Head of the Consulting Bureau of the Iraqi Engineers Union (Babylon Branch) in 2006. He participated in the Iraqi Codes Committees, such as the Iraqi Code of Steel Structures and the Iraqi Code of Protecting Buildings from Fires. He took part in international conferences, such as the 2017 World Congress on Advances in Structural Engineering and Mechanics, Seoul, South Korea, in 2017; 2nd International Conference on Structure and Civil Engineering Research (ICSCER 2018) by CBEES in Prague, Czech Republic, in 2018; and the ACI Concrete Convention and Exhibition in Cincinnati, OH, USA, in 2019.
Presentation Title: **Sustainable Reinforced Concrete Structures**

Different materials used in the same reinforced concrete structure have a direct and comparable environmental impact. Reinforced concrete structures consume an excessive amount of limited limestone and other resources, as well as a large amount of energy to produce reinforcing bar, clinker, and structural concrete, all of which have a negative impact on the environment. Even though reinforced concrete structures are not widely recognized as the most sustainable solution for a variety of structural issues, reinforced concrete structural solutions are preferred in most situations due to the additional benefits they provide. Some massive structural elements such as foundations, walls, slabs, and dams may be reinforced with other nonactive raw materials, recycled concrete, or other waste materials. The influence of increasing the cement content to increase the strength of the concrete and its impact on the strength of different structural elements will be presented in this presentation. For some case studies, the proper selection of minimum concrete strength, cross section dimensions, and shapes of structural elements to produce the minimum concrete volume and reinforcing bar percentage ratio will also be discussed.

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**2nd Speaker: Dr. Saad Al-Taan, Professor**

Dr. Saad Al-Taan received his BSc in 1970 from the University of Mosul, Mosul, Iraq; his MSc in 1975 from the same university; and his PhD in civil and structural engineering from The University of Sheffield, Sheffield, UK, in 1978. He started his work as a Lecturer at the University of Mosul from 1978 to 1986, was an Assistant Professor from 1986 to 1992, and was a Professor from 1992 to 2015. He also worked as Cultural Counsel at the Iraqi Embassy, Malaysia, from 2009 to 2012. He retired in 2015 and became a Professor in the Civil Engineering Department at Philadelphia University, Amman, Jordan, until 2019. Now he is the Head of the Building Engineering and Projects Management Department at Al Noor University. He has been a member of the ACI Iraq Chapter since 2015, and was the President during the term of 2016. Dr. Al-Taan was the Dean’s Assistant for Student Affairs at the University of Mosul from 1985 to 1987, Head of the Civil Engineering Department from 2000 to 2001, and Directorate General of scholarships and cultural relationships (Ministry of Higher Education and Scientific Research, Iraq) from 2009 to 2012. He supervised 30 final-year projects, 19 MSc students, and three PhD students. He also published more than 60 papers in local, regional, and international journals and conferences. He was a member of the Engineering Consulting Bureau, College of Engineering, University of Mosul, from 1980 to 2014, where he delivered designs and checked many projects, in addition to consultancy work. His research interests include fiber-reinforced concrete, self-consolidating concrete, high-strength concrete, and finite element analysis of reinforced and fiber-reinforced concrete members.

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Presentation Title: **Reducing CO₂ Emission by Reducing Cement in Concrete**

Concrete is the most widely used building material due to its design flexibility, lower maintenance, and longer service life. Coarse and fine aggregate occupy 65 to 75% of concrete volume; cement is 10 to 20% by weight of concrete. Since 1970, cement production globally has gone from ≈500 million tons/y to 4.4 billion tons in 2020. As an average, 1 ton of ordinary portland cement (OPC) requires 1.5 to 1.6 tons of raw materials and releases 1 to 1.2 tons of CO₂. CO₂ produced by human activities is the largest contributor to global warming. In 1960, CO₂ was approximately 300 ppm and is currently approximately 412 ppm in the atmosphere. Manufacturers of cement are responsible for some 6 to 9% of global CO₂ emissions, which is far more than airlines emit altogether. Reducing CO₂ emissions can be achieved by reducing cement in concrete. This can be done by a sustainable structural concrete design, replacing cement with other materials while maintaining the required fresh and hardened properties, using mineral admixtures that increase the concrete strength without increasing the cement content, or using certain types of concrete that require less cement than conventional concrete. The first material that can be used to replace cement is ground calcium carbonate (limestone powder or dust), which is a by-product from the limestone and marble industry. The second is slag cement, which is a by-product of iron and steelmaking. The third is pulverized fuel ash (PFA), which is one of the residues generated in combustion of coal. Other mineral admixtures can be used to increase the concrete strength without increasing the cement content, such as silica fume and metakaolin. Another alternative to reducing cement in mass concrete is to use certain types of concrete that require OPC less than the conventional concrete, such as two-stage concrete (TSC) or rock-filled concrete.
Tuesday, July 12, 2022
12:00-1:00 PM Hermosillo Time / 3:00-4:00 PM Detroit Time
Co-Host Organization: ACI Northwest Mexico Chapter

México Capítulo Noroeste
Website: http://aci-mexico-nw.org/

The ACI Northwest Mexico Chapter is a nonprofit association in Northwest Mexico dedicated to research, teaching, and dissemination of cement and concrete application techniques.

Local Moderator: Arturo Gaytan, Engineer
Arturo Gaytan is a Civil Engineer who graduated from the Faculty of Engineering at the National Autonomous University of Mexico, Mexico City, Mexico. He received his master’s degree in engineering with a specialty in quality and productivity from the Tecnológico de Monterrey, Monterrey, Mexico.

1st Speaker: Pedro Castro-Borge, Doctor of Engineering
Pedro Castro-Borge is a Civil Engineer. He received his master’s degree in engineering from the Autonomous University of Yucatán, Mérida, Mexico. He received his doctorate in engineering from the National Autonomous University of Mexico, and he has a post doctorate from the Eduardo Torroja Institute of Construction Sciences, Madrid, Spain. Castro-Borge is a full Professor at Cinvestav-Merida and he is the General Director of Alconpat International.

Presentation Title: Concrete Durability Evolution of Conceptual Service Life Models
Durability is the ability of concrete to resist physical, chemical, biological, and climatic actions linked to climate change effects. The evolution of conceptual service life models to reach the expected service life is presented.

2nd Speaker: Genaro Salinas, Independent Concrete Construction Consultant
Genaro Salinas is a concrete construction Consultant and an ACI Certification Examiner with over 60 years of experience in concrete construction. He is a member of 13 ACI Technical Committees, including ACI 223, Shrinkage-Compensating Concrete. Salinas is also an ACI Northwest Mexico Chapter Officer. He was named an ACI Fellow in 2016; an ACI Honorary Member in 2020; and received the ACI Certification Award in 2019.

Presentation Title: State of Art in Solutions in Carbon-Neutral Concrete in Mexican Pavements
Present practices in reuse of deconstructed concrete elements.
Tuesday, July 12, 2022
3:00-4:00 PM Bogotá Time / 4:00-5:00 PM Detroit Time
Co-Host Organization: ACI Republic of Colombia Chapter

Website: https://www.acicolombia.org.co/

The ACI Republic of Colombia Chapter is a technical and educational society dedicated to promoting the design, construction, manufacture, and maintenance of concrete structures. The branch was created in 1977 and since then has published quarterly newsletters and held seminars to promote knowledge among its members and professionals or students interested in expanding their research. The chapter promotes the objectives of the Charter of the American Concrete Institute. This is to encourage education, technical practice, and scientific research for the development of new techniques.

Local Moderator: Gonzalo Gallo Egas, Civil Engineer

Gonzalo Gallo Egas received his degree in civil engineering from San Francisco University of Quito, Quito, Ecuador; his MSc and PhD from the University of Illinois Urbana-Champaign, Champaign, IL, USA. He is a highly motivated engineer with experience in design and consulting in infrastructure projects. He is known for managing interdisciplinary groups on complex projects and understanding customer needs. He is recognized for experience based on advanced academic studies and articles published in journals and conference proceedings, as well as academic presentations and industry topics. Egas is strongly inclined toward quality and quality control, internal audit, management, and innovation. He participates in internal education conferences and working groups conferences and is a member of industrial organizations dedicated to learning.

1st Speaker: Carlos Arteta, Associate Professor, Department of Civil and Environmental Engineering, Universidad del Norte, Colombia

Carlos Arteta is an Associate Professor of civil engineering at Universidad del Norte, Barranquilla, Colombia. He is a member of ACI Committee 318, Structural Concrete Building Code, and ACI Subcommittee 318-H, Seismic Provisions. He is a Founding President of CEER - Colombian Earthquake Engineering Research Network, and a member of the Board of Directors of the ACI Republic of Colombia Chapter and the Colombian Association for Earthquake Engineering. His research interests include response and design of buildings to earthquake actions, with expertise in analysis, design, and risk evaluation of reinforced concrete structural systems.

Presentation Title: Risk-Based Assessment of the Seismic Response of ACI 318-Compliant Moment Frames with Intermediate Detailing

The seismic response of reinforced concrete frames under intermediate seismic hazard is explored from a risk-based approach. A set of archetypical moment frame buildings are analyzed using hazard-consistent ground motions, selected with the conditional scenario spectra (CSS). The CSS assigns a rate of occurrence to the input ground motions based on their spectral shape and intensity, such that the hazard a site can be modeled from 100 to 10,000 years return period. The structural response gathered with the CSS through inelastic nonlinear analysis is assigned these rates of occurrence to estimate the risk of engineering demand parameters of interest such as story drift ratio and plastic rotations.
Daniela M. Martínez is an Assistant Professor at Universidad del Norte. She received her MS and doctorate degrees in civil engineering at the University of California, Berkeley, Berkeley, CA, USA. Dr. Martínez’s specialization is structural engineering, with emphasis on structural construction materials and how they can be optimized to minimize the carbon footprint. Her research interests include sustainability-based evaluation for potential use of calcined clays as a supplementary cementitious material in concrete applications.

Presentation Title: Life-Cycle Assessment as a Tool to Calculate Greenhouse Gas Emissions from Blended Cements

Considering the scale and urgency of climate change, many researchers have explored the development of less environmentally damaging cements and improvements in concrete production. Clinker-cement reduction is one of the most significant strategies to mitigate the environmental impact of cement production worldwide. This study aims to compare greenhouse gas (GHG) emissions and the energy demand of common mixed cements in the United States with those of ternary mixtures. The environmental impact of portland cement is also included in the assessment. Compared to commercially available combination cements, cements containing metakaolin and limestone (replacement of 35% and 15% by weight, respectively) could potentially reduce GHG emissions from cement manufacturing by between 5 and 40%, depending on the overall replacement rate and the availability of other supplementary cementitious materials (SCMs) that do not need to be processed (that is, calcined at high temperatures) to exploit their pozzolanic behavior and react with clinker during cement hydration. Therefore, the use of limestone-calcined clay cements could meet the high demand for cement and contribute effectively to the overall reduction targets set out in the Intergovernmental Panel on Climate Change (IPCC) and United Nations Environment Programme (UNEP) reports for the cement industry by 2050.
IBRACON - Instituto Brasileiro do Concreto is a technical-scientific organization for the defense and enhancement of civil engineering nationwide and is an associative nonprofit with unlimited duration founded in 1972 by professionals and stakeholders in the concrete production chain. Its objective is to provide professionals and stakeholders in the national construction sector with information and knowledge on research, development, and innovation in concrete technology and its construction systems. To this end, IBRACON promotes specialization courses, edits technical publications, encourages and supports the formation of technical committees, certifies people, and organizes technical events. Every year, IBRACON organizes the Brazilian Concrete Congress, the largest national technical-scientific event on concrete technology and its construction systems, which aims to bring together the national and foreign technical and scientific community to debate and learn more about research, developments, and innovations related to concrete and its constituent materials, structural analysis and design, construction methodologies, management and technical standardization, and other related topics.

Local Moderator: Cesar Henrique Sato Daher, Civil Engineer, MSc

Cesar Henrique Sato Daher has taken complementary international courses in advanced pathology and special concretes at institutions in Canada, England, Spain, Portugal, and Mexico. He received his master's degree in civil construction and civil engineering from the Federal University of Paraná (UFPR), Paraná, Brazil. He is a Building Technician at the Federal University of Technology - Paraná (UTFPR), Paraná, Brazil, a Founding Partner and Planning Director of the IDD Educational Group, and a Founding Partner of DAHER Engenharia Consultiva. He was a Professor of civil engineering at Universidade Positivo, Paraná, Brazil; at Universidade Tuiuti do Paraná, Paraná, Brazil; and at the Pontificial Catholic University of Paraná, Paraná, Brazil. Daher has experience in the field of civil engineering, with an emphasis on construction materials and components, working mainly on the following subjects: conventional/special concretes, quality control, and pathologies in civil works and mortars. He was a world record holder in quality control of high-performance concrete ($f_{ck} = 90$ MPa - Centro Empresarial Antártica) in 2006, as well as a pioneer in quality control of high-performance concrete in Paraná State (Ed. Evolution Towers - $f_{ck} = 60$ MPa, 2004). He is technically responsible for the quality control of concrete and materials of several major works (residential, commercial, industrial, and infrastructure) in Paraná and Brazil (including the tallest building in Curitiba, Universe Life Square), in addition to technical reports related to the diagnosis of pathological manifestations and the quality of materials used in engineering works. He was President of the Brazilian Association of Construction Pathology (ALCONPAT Brasil) from 2018 to 2021, and has been a member of the Board of Directors/Director of Institutional Relations at the Brazilian Concrete Institute - IBRACON since 2019.
1st Speaker: Hugo Armelin, PhD

Hugo Armelin is the Sales and Marketing Director for Votorantim Cimentos Brasil. He graduated with his degree in civil engineering in 1990 from The University of São Paulo, São Paulo, Brazil, and went on to receive his PhD in civil engineering at the University of British Columbia, Vancouver, BC, Canada. For the past 25 years, he has been involved in various market development initiatives in the construction business in Brazil, with a career at Lafarge, Monier, and lately Votorantim Cimentos. For the past 2 years, he has been part of the Board of Directors of IBRACON, Brazil’s leading concrete institute, with a 50-year tradition in promoting technical information in Brazil.

Presentation Title: Concrete for a Lower CO₂ Emission in Brazil

Brazil is known for having a low carbon emission cement industry (due mainly to the local availability and development of cementitious additions as a standard for decades). Nevertheless, there is a continuous need for further minimization of CO₂ emission not only at the cement production level but also in the concrete that results. Recognizing this need, Votorantim Cimentos developed a new range of concrete mixtures with advanced properties of higher compressive strength and modulus of elasticity with a lower CO₂ per cubic meter emission. Furthermore, this specific range of concretes (commercially named “Spectra”) has also allowed for lower CO₂ emissions per constructed area (CO₂ per square meter built) through the reduction in column section and/or steel content. After more than 80 km³ successfully applied in various projects, there will be a report on the development of Spectra concrete from the concrete technology point of view which will focus on the interaction with designers to make use of its mechanical properties to increase the overall CO₂ efficiency of the structures.

2nd Speaker: Heloisa Fuganti Campos Marques, PhD

Heloisa Fuganti Campos graduated from the Federal University of Paraná, Curitiba, Brazil, where she also received both her MSc and her PhD degrees in civil engineering. She is a Specialist in structural concrete systems from the Institute of Technological Education De Luca Daher (IDD), 2017. She is currently Adjunct Professor at the Federal University of Paraná (UFPR) in the areas of civil construction, civil construction materials, and project management, where she has been teaching since 2015. She has experience in civil engineering, with an emphasis on construction materials and components, working mainly on the following topics: mixture design of sustainable/eco-efficient concrete, high-strength concrete, and particle packing techniques. She also has experience in wooden structures, with emphasis on structural design, production, and execution of wood frame structures.

Presentation Title: Mixture Design Method of Concrete for a Lower CO₂ Emission

A sustainable approach to concrete mixture design is essential for the construction industry because it is one of the major sectors responsible for CO₂ emissions worldwide. With the proposed mixture design method, some concretes were designed with a compressive strength of 104 MPa using 288 kg/m³ of cement. This represents a consumption of only 2.8 kg of cement/MPa of concrete compressive strength, which is less than the consumption reported in the literature for HSC (~5 kg/m³/MPa) and results in a CO₂ emissions/MPa reduction of over 44% in relation to concrete produced using mixture design methods described in the literature. Furthermore, all the low-cement concretes studied presented high workability, excellent quality (according to the ultrasonic pulse velocities (above 4500 m/s)), and insignificant corrosion risk (based on the electrical resistivity test (higher than 100 KΩcm)). These results demonstrate that—in addition to producing more sustainable concrete—the proposed method allowed the concrete to achieve excellent parameters in both fresh and hardened states.
Since circa 1978, the ACI Ecuador Chapter has been working with concrete professionals around the country to promote knowledge, helping them achieve quality concrete by granting access to the tools and materials ACI has to offer with educational programs, certifications, guides, standards, and codes. The ACI Ecuador Chapter also promotes ethical work by professionals and students involved both with the professional chapter as well as other student chapters.

**Local Moderator: Guillermo Loayza, PCS**

Guillermo Loayza is an Industrial Engineer as well as a CEO at Setmix Products, with businesses in Ecuador, Colombia, Panama, Peru, and Bolivia. He received his MBA with a major in integrated quality assurance systems, and has over 20 years of experience offering extensive solutions for mixing, repairing, reinforcing, and protecting concrete structures. Loayza has specialized in protective coatings by the Society for Protective Coatings (SSPC). He has served as SSPC Society for Protective Coatings Ecuador Chapter’s President and is the current ACI Ecuador Chapter President. Loayza is also President of the SSPC Latin America Advisory Council. He is an active member of several committees on concrete repair and protection within both organizations.

**1st Speakers: Pablo Andrade, Civil Engineer, and Guillermo Loayza Sr., Civil Engineer**

Pablo Andrade graduated as a civil engineer from the Universidad San Francisco de Quito (USFQ), Quito, Ecuador. Since 1997, he has held numerous positions including Plant and Technical Manager. Currently, he is the General Manager at Quarry Cymca Guayllabamba, Head of Infrastructure at Sico and Sicocar Guayaquil, Technical and General Manager at Mezclalista ReadyMix Batch Plant S.A. Proyecto Nuevo Aeropuerto de Quito, and is currently General Manager at Unicon Ecuador Batch Plant.

Guillermo Loayza Sr. received his bachelor’s degree in civil engineering from Southwestern University, Georgetown, TX, USA, and a specialization in England at the Advanced Concrete Technology C&C Association. He has been the Creator and Developer of SETMIX products and services for more than 35 years. He was the past Director of Sika Ecuador from 1975 to 1986, and Technical Consultant on high-performance concrete projects with the use of additives for concrete mixtures. Loayza was President of the ACI Ecuador Chapter from 2000 to 2003, and a postgraduate Professor in concrete at Universidad Central del Este (UCE), San Pedro de Macorís, Dominican Republic, from 1990 to 1993, as well as a speaker of several talks for universities and national and international organizations.

**Presentation Title: Concrete Knowledge: Importance of Optimizing Cement Use to Reduce Waste and Contamination**

Combining knowledge on ready mixed concrete and admixtures design and correct use. Two experts will share their experience on how a ready mixed plant contributes to reducing green production processes by optimizing cement and aggregates use to achieve better and more sustainable results.
2nd Speaker: Andres Sarzosa, Sustainability Specialist

Andres Sarzosa has more than 10 years of technical experience and is currently leading production for a low-carbon economy program financed by the United Nations Environment Programme (UNEP), Carbon Footprint and Circular Economy at CERES Ecuador. He became the National Coordinator of the Initiative for Climate Action Transparency—Ecuador by UNEP DTU Partnership, and has been a Senior Consultant for climate change projects with CAF, Green Climate Fund, and Inter-American Development Bank.

Presentation Title: Technical Guide of Procedures and Methodology for the Collection and Management of Data for the Cement Sector, Results of the Initiative for Climate Action Transparency—Ecuador

Leading the feasibility project studies for zero carbon emission compliance, the speaker will share data collection and the development process for the initiative on reducing carbon emissions for cement plants produced in Ecuador.
The ACI Southeast Mexico Chapter aims to further the objectives of the American Concrete Institute. It was organized to further education and technical practice, scientific investigation, and research by organizing the efforts of its members for a nonprofit, public service in gathering, correlating, and disseminating information for the improvement of the design, construction, manufacture, use, and maintenance of concrete products and structures. The Chapter’s activities extend through Chiapas, Campeche, Tabasco, Quintana Roo, and Yucatán, Mexico.

Local Moderator: Josseph Eli Mandujano Zavala, Professor

Josseph Eli Mandujano Zavala is a Professor at the Autonomous University of Chiapas (UNACH), Chiapas, Mexico. He has worked for 10 years in different fields in concrete. He is also Founder and the first President of the ACI Southeast Mexico Chapter. Periodically, he has been the Faculty Advisor for the ACI UNACH student chapter. He is also a member of ASTM International Committees C01, Cement; C09, Concrete and Concrete Aggregates; and E07, Nondestructive Testing. He is also a member of ACI Committees S803, Faculty Network Coordinating Committee; 214, Evaluation of Results of Tests Used to Determine the Strength of Concrete; and 228, Nondestructive Testing of Concrete, and ACI Subcommittee 130-D, Rating Systems/Sustainability Tools. He received his ACI Certification as a Concrete Field Testing Technician - Grade I, Aggregate Testing Technician - Level 1, and Concrete Strength Testing Technician. He is also an ACI-approved examiner. Mandujano’s research interests include the structures and rehabilitation of existing structures, and concrete technology and materials. Mandujano received his BS in 2012, his ME in 2014, and his PhD in civil engineering, all from UNACH. He was Manager of the Materials Laboratory, Concrete Technology Laboratory, and Soil Laboratory, where he managed research and coordination of projects in different fields pertaining to concrete, soil, and masonry. He is currently Head of the Durability and Materials Characterization Laboratory.

1st Speaker: Arturo Gaytan Covarrubias, FACI, Innovation and Sustainability Manager, CEMEX

Arturo Gaytan Covarrubias, FACI, is the Innovation and Sustainability Manager at CEMEX México, based in Mexico City, Mexico, where he has worked in different positions for 18 years. He is also Treasurer of the Mexican Ready-Mix Concrete Association, Founder and President of the Mexican Institute for Sustainable Concrete, and Liaison Director of the ACI Northwest and ACI Southeast Mexico Chapters. He has been an ACI Fellow since 2018 and is a member of several ACI committees, including the Educational Activities Committee, International Certification, Personal Awards Committee, International Advisory Committee, and ACI Committee S801, Regional Student Competitions Task Group. He is also a member of ACI Committees 121, Quality Assurance Systems for Concrete, and 130, Sustainability of Concrete, and ACI Subcommittees 130-D, Rating Systems/Sustainability Tools, and 130-H, Climate Change Impacts on the Sustainability of Concrete. He was Past President of the ACI Central and Southern Mexico Chapter from 2013 to 2014. He is also a member of ASTM International Committees C09, Concrete and Concrete Aggregates, and E60, Sustainability. Covarrubias received the ACI Young Member Award for Professional Achievement and was named an International Electrotechnical Commission (IEC) Young Professional in 2012. He received the 2018 ACI Chapter Activities Award. Covarrubias received his BS in civil engineering from the National Autonomous University of Mexico (UNAM), Mexico City, Mexico, in 2002, and his ME in quality and productivity from the Monterrey Institute of Technology and Higher Education, Monterrey, Nuevo León, Mexico, in 2009.
Presentation Title: **Race to Net-Zero Carbon Concrete in Mexico**

The technologies and strategies that are being used in Mexico to start the race to offer zero-emission concrete are presented.

2nd Speakers: **Alessandro Beghini, PhD, SE, PE, LEED® AP Structural Engineer Associate Director, and Eric Long, PE, SE, LEED® AP, Structural Engineering Director**

Alessandro Beghini is an Associate Director and Structural Engineer with Skidmore, Owings & Merrill LLP, in San Francisco, CA, USA. As a Structural Engineer, Beghini works to develop the structural design for individual projects and project groups. Coordinating with the architectural and building services teams, he incorporates structural engineering design concepts within project requirements. His responsibilities also include overseeing the preparation of the complete structural engineering documents and reviewing them for compliance with the approved program. Beghini is also responsible for conducting research in the field of optimal structural topologies and development of innovative methodologies for structural analysis. To this end, he maintains on-going collaborations with academic institutions, including the University of Illinois at Urbana-Champaign, Champaign, IL, USA. He also serves as an Adjunct Professor at Northwestern University, Evanston, IL, for his work in structural optimization. He has co-authored several technical publications on a variety of structural engineering topics ranging from topology optimization to behavior of fiber composites and fiber reinforced concrete.

As a Structural Engineering Director in the San Francisco office of Skidmore, Owings & Merrill LLP, Eric Long incorporates innovative structural engineering design concepts to drive new solutions in building design and construction. Long works in close collaboration with the architectural, MEP, and entire design team to develop integrated ideas, advancing each project in pursuit of design excellence. He maintains this focus through the entire structural design process, from the development of the structural concept and selection of building systems, through final construction documentation and administration. Long’s project experience includes the design of office, residential, and multi-use mid-rise and high-rise structures in addition to complex multi-building developments. Among his most notable projects are the United States Embassy in Beijing, China, the Cathedral of Christ the Light in Oakland, CA, 350 Mission in San Francisco, CA, and the New Federal Courthouse in Los Angeles, CA. Long has successfully incorporated innovative and technologically advanced structural applications into the design of these projects including seismic base-isolation, long-span cable structures, integrated glass curtain wall systems, and performance-based seismic design. Long is involved in teaching an integrated architectural studio class focusing on the creative collaboration of architecture and structural engineering involving students from Stanford University, University of California Berkeley, Cal Poly, and California College for the Arts. He frequently lectures on a wide variety of topics including the application of advanced technology in design, seismic performance and resiliency, and the unique design solutions of individual projects.

Presentation Title: **Beyond Net Zero: Leveraging Technology Toward a Carbon-Removal Economy**

The need to transform the built environment is clear. The building sector generates nearly 40% of all global carbon emissions. At COP26, SOM unveiled Urban Sequoia. The central proposition is that the built environment can absorb carbon by holistically optimizing building design, minimizing materials, integrating biomaterials, and advancing biomass and carbon capture technologies. Urban Sequoia achieves substantially more significant carbon reductions than have been achieved by applying these techniques separately. Materials such as bio-brick, hempcrete, timber, and biocrete reduce the carbon impact of construction by 50% compared to conventional materials. This solution allows us to move beyond net zero to deliver carbon-absorbing buildings. As urban populations continue to grow in the coming decades, studies have predicted that another 230 billion square meters of new building stock will be needed by 2060. To fight the embodied and operational carbon that would otherwise be generated, forward-thinking and technology will be needed to revolutionize the way we design and maintain infrastructure. Captured carbon and biomass can be used to produce biomaterials for roads, pavement, and pipes. By converting urban hardscapes into gardens and retrofitting streets with carbon-capturing technology, former grey infrastructure can sequester a significant tonnage of carbon.
ACI Guatemala Chapter was founded in 2006, and the chapter currently has 27 international members, 28 local members, and 1326 student members. Within their main activities, the chapter sponsors activities targeted to the 21 active Student Chapters in Guatemala, for example: seminars, ACI Certifications (reduced price), and competitions (National Competition of Concrete Cylinders since 2012, Investigation Award since 2015, and Concrete Soccer Balls Competition since 2019). The chapter members have also been active participants in the National Standardization Technical Committees of Cement and Concrete. The chapter develops seminars targeted to professionals, technicians, and the general public. The ACI Guatemala Chapter is also an LSG that develops six ACI Certification Programs. Most of the chapter activities are developed with the support of the Institute of Cement and Concrete of Guatemala (ICCG) (ACI International Partner), with whom it has a Memorandum of Understanding.

The ICCG was born at the initiative of the country's cement and concrete industry in November 2006. The ICCG is an autonomous, private, civil, nonprofit, nonreligious, and nonpolitical association formed by companies from the cement and concrete industry in Guatemala. We have a relationship with entities and associations at a national and international level whose objectives are similar to ours, including FICEM, FIHP, ASTM, ACI, and others. ICCG's Mission is to promote and develop the cement and concrete industry in Guatemala. ICCG's Vision is to develop Guatemala as a country with a culture of the use of cement and concrete, with a sustainable future in the construction of quality works consistent with the conservation of the environment, safety, performance, durability, and social responsibility.

Local Moderator: Plinio E. Herrera, Concrete R&D Manager, Cementos Progreso, and ACI Chapter President, Guatemala Chapter

Plinio E. Herrera is a Concrete Research & Development Manager at Cementos Progreso in Guatemala City, Guatemala. During his more than 30 years of experience in concrete materials, he has promoted the research and development of products and solutions related to concrete and its applications, and has worked tirelessly on knowledge transfer to the construction industry and academia in subjects like cement, concrete, aggregates, concrete pavements, and housing. He has reviewed and sponsored several thesis and experimental projects with students from state and private universities in Guatemala. Herrera has participated in proposing, reviewing, and translating national standards related to cement, concrete, and its applications. He has been a speaker in international seminars and meetings related to cement, aggregates, concrete technology, concrete roads, and housing. Herrera is an ACI Fellow and President of the ACI Guatemala Chapter. He is a member of ACI Committees E701, Materials for Concrete Construction; 130, Sustainability of Concrete; 211, Proportioning Concrete Mixtures; 225, Hydraulic Cements; and 237, Self-Consolidating Concrete. He is also a member of ACI Subcommittees C601-E, Concrete Construction Sustainability Assessor; 130-G, Education; and 211-N, Proportioning with Ground Limestone and Mineral Fillers. He has participated in the past with translation reviews for ACI International Development and ACI University. His research interests include self-consolidating concrete, fiber-reinforced concrete, high-strength/high-performance concrete, ultra-high-performance concrete, and 3-D printing materials and processes. He received his degree in civil engineering from the...
Universidad de San Carlos de Guatemala (USAC), Guatemala City, Guatemala, in 1994, and his Master of Business Administration (MBA) from the Pontificia Universidad Católica de Chile (PUC), Santiago, Chile, in 2008. He is a licensed professional civil engineer in Guatemala, No. 3876. Recently, he received the distinction of 25 years of professional service as a civil engineer in Guatemala. He is also a member of ASTM International and the American Society of Civil Engineers (ASCE).

1st Speaker: Eduardo Lavarreda, CEO and Founder, 4PISOS Company

Eduardo Lavarreda is a Civil Engineer graduated from Rafael Landívar University, Guatemala City, Guatemala. His first professional years were in designing concrete structures, and in 1998, as a Founding Partner of a regional flooring company, he accumulated experience in designing and building more than 50,000,000 square feet of slabs-on-ground, pavements, and elevated slabs. He has participated as a speaker in multiple conferences nationally and internationally, and at present, he is acting as General Director of his own flooring company, focused in high-end concrete slabs-on-ground for industrial and logistics facilities, optimizing the use of resources and reducing operating costs through the expected life of the floor. With more than 20 years of experience, he has been pioneering the implementation of new design and construction technologies in Central America.

Presentation Title: Optimizing the Performance of Slabs on Ground for a Distribution Center

A look at new technologies used in a high-performance floor for a distribution center, from a full system performance optimization, starting below grade up to the top surface. The combination of state-of-the-art products and design techniques allows present and future floors to optimize their thickness, dramatically extend joint spacings by at least five times, and lower maintenance costs.

2nd Speaker: Ludwin Alvarez, Environmental Control and Monitoring Manager

Ludwin Alvarez is a Chemical Engineer with an emphasis on energy. He has a master's degree in public administration, postgraduate studies in reducing greenhouse gas emissions, and he is currently pursuing a doctorate in sustainable development. At a professional level, he has been a Consultant on climate change for government and international cooperation institutions such as the National Council for Protected Areas, the Ministry of Foreign Affairs, and the Independent Association of Latin America and the Caribbean. He has represented Guatemala as a national delegate at the UNFCCC Conference of the Parties. He is currently Manager of environmental control and monitoring at Cementos Progreso.

Presentation Title: Cement and Concrete Facing Climate Variability in Guatemala

According to various climate risk indexes, Guatemala and the Central American region rank high among the most affected countries by climate variability worldwide. As developing economies, the region has a growing demand for infrastructure services that will need to be safe, durable, and resilient to help adapt to weather effects. Despite having special local economic, social, and cultural conditions, recognizing the common but differentiated responsibilities and aware of the importance of voluntarily contributing to the reduction of greenhouse gases, Progreso has developed various initiatives to reduce emissions, such as the reduction of the clinker factor, the co-processing of residues and solid and liquid waste, the substitution of internal combustion land transport for electrical systems, and reforestation activities, among others.
Website: https://concretenz.org.nz/page/learned_society_home

The Concrete New Zealand (NZ) Learned Society is a professional society that sits under the umbrella of Concrete NZ. The Learned Society facilitates the sharing of industry knowledge, participates in the development of concrete and construction, and provides a foundation for building valuable business networks, in New Zealand and overseas. The Learned Society aims to encapsulate the wealth of expertise of its membership and to output this in the form of seminars, technical publications, and conferences for the betterment of the concrete and construction industry at large. With an emphasis on “Learned,” the Society is focused on technical excellence and is not influenced by any external commercial interests. The Concrete NZ Learned Society maintains strong relationships with affiliated organizations internationally, including the American Concrete Institute (ACI), the Concrete Institute of Australia (CIA), and the Fédération internationale du béton (fib).

**Local Moderator:** Rick Henry, Associate Professor

Rick Henry is an Associate Professor in the Department of Civil and Environmental Engineering at the University of Auckland, Auckland, New Zealand, where he teaches the design of concrete structures. His research interests include the seismic design and assessment of reinforced concrete structures, in particular, precast concrete construction and low-damage design. Henry is the current Vice President of the Concrete NZ Learned Society. He has served as a member of the technical committee for the NZ Concrete Structures Standard (NZS 3101:2006) and is a current member of ACI Subcommittee 318-H, Seismic Provisions.

**1st Speaker:** Dr. Charlotte Toma, Lecturer, University of Auckland

Charlotte Toma joined the University of Auckland in 2018 as a Lecturer in the Structures Group. Her research interests have expanded to include sustainable design, design for natural hazards, and beyond code seismic resilience. Across her roles at the university, as lead of the Developing Leading Women Programme, and within Structural Engineering Society New Zealand (SESOC), she is active in bringing change to the structural industry. Toma holds a BE(hons) and a PhD from the University of Auckland, where her research focused on the seismic assessment and retrofit of unreinforced masonry buildings, and has been cited in The Seismic Assessment of Existing Buildings 2017 document and ASCE 41. Following her PhD, she worked as a Design Engineer for Holmes Consulting for 6 years, working on a range of assessment and new-build projects, including the Commercial Bay development.

**Presentation Title:** Linking the Drivers for Change of Carbon Reduction and Seismic Resilience

Improving seismic resilience and achieving net-zero carbon builds are two of the greatest challenges facing the New Zealand construction industry (and arguably all seismic countries) in the coming decade. Structural engineers in New Zealand and around the world have historically designed buildings for collapse prevention during and following earthquakes, with limited regard to the usability of the structure post-event. This approach has generally been effective in achieving life safety, but recent events have highlighted the wide-ranging social, economic, and environmental impacts. For example, following the Christchurch Earthquake sequence, 60% of multi-story commercial reinforced concrete buildings were
demolished. These outcomes are contrary to the principles of sustainable development advocated by stakeholders, policymakers, and the general public. In parallel with the drive to improve seismic resilience, we also have the very real and pressing need to actively reduce the embodied carbon in the structures being designed. Greenhouse gas emissions represent an immediate threat to our climate and biodiversity, as strongly expressed in the recent IPCC report. The move toward sustainable design, however, has raised concerns regarding the emphasis on “lean design” and “material efficiency” and how these objectives may be at odds with improved seismic resilience of buildings. Achieving a balance between seismic resilience and material efficiency is not just a question of minimizing embodied carbon but is also critical for informing broader conversations around the future of seismic risk and building performance. A team at the University of Auckland is exploring how the seismic performance objectives impact the upfront embodied carbon at construction, and the environmental impact over the life of the building through risk-based life-cycle cost-benefit analysis. This project will couple the “drivers for change” of carbon reduction and seismic resilience.

2nd Speaker: Ben Marsh, Manufacturing Manager, Golden Bay Cement

Ben Marsh is the Manufacturing Manager at Golden Bay Cement. He holds a BE(Mech) with a background in mechanical engineering and project engineering/management. He has 8 years of experience in the cement industry working for Golden Bay Cement.

Presentation Title: Golden Bay Cement's Waste End-of-Life Tyre Project

Prior to 2017, with no local sustainable disposal options available, Waste End-of-Life Tyres (WELT) were accumulating around the country and brought with them the unwarded hazards associated with tyre stockpiles. Golden Bay Cement and the New Zealand Ministry for the Environment partnered on the End-of-Life Tyres Project that would see up to 3 million WELT diverted from landfills and used as thermal fuel in the cement manufacturing process at Golden Bay Cement Portland Cement Works. Work on this project began with a range of national and international experts being brought in to assess the change in effects when using WELT as a fuel in the cement manufacturing process. The assessment showed that the effects of WELT versus traditional fossil fuel (coal) were significant, and a change in Resource Consent was granted. Detailed equipment design and procurement commenced for the specialists’ equipment that would be used to combust the WELT in the pyro process. Over a 2.5-year period, the project team worked with a wide range of suppliers and contractors to prefabricate and preassemble equipment in preparation for the main shutdown when the final modifications to the process would be made. In January 2021, Golden Bay Cement shutdown clinker manufacturing for 31 days to complete the final stages of the process modifications. During this period, teams worked to remove and reinstall section of refractory lines, process equipment, and the installation of the 180t HotDics reactor. In March 2021, Golden Bay Cement commenced the use of WELT in substitution of coal and has reached addition rates as high as 35%. Up to 1.7 million WELT are being consumed each year, and once at full capacity, it is planned to use up to 3 million WELT annually. The use of WELT in place of coal has reduced CO₂ process emissions by over 90,000 tonnes annually.
Wednesday, July 13, 2022
12:00-1:00 PM Sydney Time / 10:00-11:00 PM Detroit Time
Co-Host Organization: Concrete Institute of Australia

Website: https://concreteinstitute.com.au

The Concrete Institute of Australia is an independent, not-for-profit, professional development association made up of members who share a common interest in staying at the forefront of concrete research, technology, application, design, and construction. The Institute's mission is for excellence in concrete through the promotion and development of concrete research, technology, application, design, and construction in Australia.

Local Moderator: David Millar, Chief Executive Officer, Concrete Institute of Australia

David Millar is the Chief Executive Officer of the Concrete Institute of Australia. As a civil engineering graduate from The University of Sydney, Sydney, NSW, Australia, Millar began his career in the concrete aggregates industry, before expanding into precast concrete, construction chemicals, and concrete materials. With a great appreciation of what industry and professional associations can provide to the concrete industry, Millar has been, and is still, an active member on several concrete-related committees as a volunteer. He was also the Executive Director of the Concrete Pipe Association of Australasia from 2005 to 2013, before commencing his current role with the Concrete Institute of Australia in 2014. Millar's 25+ years in the construction industry have revolved entirely around concrete, and through this experience, he understands the importance this most traditional, but ever-evolving, material has in society and the environment.

1st Speaker: John Hilton, Group Capability Leader, Bridges and Civil Structures, and Design Director, Bridges, Aurecon

John Hilton joined Aurecon over 30 years ago and is Aurecon's Global Capability Leader for Bridges and Civil Structures. In 2016, Hilton was awarded the Roads Australia Technical Excellence Award, and in 2018, he was named as one of Engineers Australia’s 30 Most Innovative Engineers. Hilton was awarded the 2018 John Connell Gold Medal from Engineers Australia Structural College. He is passionate about exploring new ideas, innovation, design-led thinking, and sustainable construction, and in helping to create and enable a professional environment where people can thrive and grow. He is also Chair of the AS 5100 Bridge Design Standard committee and a member of a number of associated subcommittees.

Presentation Title: Concrete Bridges in the New Millennium: The Imperative for Innovation

In the late 19th century, 14% of people lived in cities. Today this is over 50% and the birth rate is double. By 2050, the proportion of city dwellers will be 70%, and the population in cities will have grown from 3.5B today, to 7.0B. Therefore, are the bridges we are designing today going to meet the unprecedented needs for speed of construction, sustainability, and adaptability needed for the future? Maybe, but clearly in some cases, probably not. This presentation will look at the key imperatives for innovative concrete bridge design, particularly in Australia. Examples will be provided where innovation in bridges has reduced cost, enhanced function, or reduced construction risk, such as developments in both concrete materials and the use of precast construction.
2nd Speakers: **Professor Stephen Foster, Dean of Engineering, UNSW, and Craig Heidrich, Managing Director, HBM Group**

**An Honorary Member of the Concrete Institute of Australia, Professor Stephen Foster is Dean of Engineering at the University of New South Wales (UNSW), Sydney, NSW, Australia. Foster received his PhD from UNSW in 1993, and has a distinguished record in the field of structural concrete and concrete materials. His main research interests include bringing new materials technologies to the design of concrete structures, including fiber and ultra-high-performance concrete, low-carbon construction materials such as geopolymer and alkaline-activated concretes, and high-strength reinforcing steels. Foster is a Fellow of Engineers Australia, Fellow of fib, Honorary Member of the Concrete Institute of Australia (CIA), and a member of several Australian and international standards committees. He is elected Deputy President of the International Federation for Structural Concrete (fib) and a member of the fib Presidium. Foster is also an integral Standards Australia committee member for the two major concrete standards in Australia – BD-002 for AS 3600, Concrete Structures, and BD-090 for AS 5100.5, Concrete for Bridges.**

**Craig Heidrich is the Managing Director of HBM Group, a company with 26 years of experience in providing professional industry association management services and strategic management support, focusing on industry advocacy, RD&D management, policy development, and membership support. Heidrich’s company has led the “circular economy” revolution in Australia before the term was coined, leading the charge toward the effective use of industry by-products and recoverable mineral resources.**

**Presentation Title: To Carbon Neutral Concrete Construction through Technology and Standards**

Research conducted for the Cooperative Research Centre (CRC) for Low Carbon Living in Australia has identified several barriers to the widespread implementation of alternative, low-CO₂ concrete such as geopolymers. It was found that the lack of standard specifications, lack of long-term performance data, and non-compliance with AS 3600 (the Australian concrete structures code) were major obstacles to adoption. Therefore, current research is addressing these deficiencies through the preparation of a Handbook in association with Standards Australia. The primary purpose of the Handbook will be to assist engineers and end-users in specifying and constructing with geopolymer concrete. This presentation will provide an update on the research, development, and practical applications.
Japan Concrete Institute (JCI) has been striving to develop the science and technology of concrete in Japan. As of 2021, the number of members is approximately 7500. Since 1979, JCI has been holding an Annual Convention once a year (over 3 days), which is attended by concrete researchers and engineers from various fields. The 44th Annual Convention will be held online in July 2022. JCI publishes monthly Concrete Journal and presents a multifaceted range of information including commentaries, technical reports, construction records, and international information on a regular basis. Concrete Research and Technology and ACT (Journal of Advanced Concrete Technology) are posted on the website “Japan Science and Technology Information Aggregator, Electronic” (J-STAGE) at the same time that they are published for uncharged access. JCI awards include the Honorary Membership Award, Lifetime Membership Award, JCI Fellow, the Japan Concrete Institute Awards (Meritorious Deed Award, Best Paper Award, Technology Award, Encouragement Award, and Work Award), as well as other awards bestowed under the independent award schemes of JCI chapters. For the purpose of raising the technical skills and ability of concrete engineers, JCI has been administering Authorized Concrete Engineer qualification examinations since FY 1970, and Authorized Chief Concrete Engineer qualification tests since FY 1971, certifying thus far approximately 58,400 people. JCI has been holding Concrete Diagnosis and Maintenance workshops and Authorized Concrete Diagnosis & Maintenance Engineer qualification examinations every year since FY 2001, certifying approximately 14,000 people.

Local Moderator: Professor Mitsuyoshi Akiyama

Before joining Waseda University, Tokyo, Japan, in 2011 as a Professor of civil engineering, Dr. Akiyama was an Assistant and Associate Professor at Tohoku University, Sendai, Miyagi, Japan. In 2001, he received a doctorate in civil engineering from Tohoku University. He is now the Chair of the Department of Civil and Environmental Engineering at Waseda University and President of Engineers Without Borders Japan. He was a Visiting Research Associate at Lehigh University, Bethlehem, PA, USA, from October 2008 to September 2009 (sponsored by Kajima Foundation), and from August 2018 to September 2019 (sponsored by Japan Society for the Promotion of Science (JSPS)), and a Visiting Professor at National Taiwan University of Science and Technology, Taipei, Taiwan, in 2020. His research interests include earthquake engineering, life-cycle structural performance and reliability, and risk and resilience assessments of civil infrastructure systems. He is the recipient of several awards, including the 2001 JCI Award for Engineering Development; the 2007 JSCE Encouragement Award for Outstanding Thesis; the 2008 Commendation for Science and Technology; the 1998, 2008, and 2010 JSCE Yoshida Award; and the 2016 IABMAS Junior Award. He is serving as a Managing Editor for Structure and Infrastructure Engineering and an Associate Editor for the ASCE Journal of Bridge Engineering.

1st Speaker: Professor Masami Ishikawa, Tohoku Gakuin University, Dr. of Eng.

Masami Ishikawa worked as a Concrete Engineer for 18 years at Tokyu Construction Co., Ltd., since 1984, and moved to Tohoku Gakuin University, Sendai, Miyagi, Japan, in 2002 as a Professor in the Department of Civil and Environmental Engineering. In 1985, he joined the “JCI Technical Committee on Massive Concrete Structures,” which was established in 1981. He has worked as a committee member for almost 20 years. In 2021, he became the Chairman of the “JCI Committee on Computer Code Development for Crack Control in Massive Concrete,” which has taken over the activities of “JCI Technical Committee on Massive Concrete Structures.” He is also the Project Leader of development of JCMAC3 English version. As a recent achievement of study, he received the Best Presentation Award of “CONCRACKS,” in 2016, the JCI-RILEM International Workshop on Control of Cracking of Mass Concrete and Related Issues Concerning Early Age Cracking of Concrete Structures.
**Presentation Title:** Performance and Demonstration of 3D FEM Initial Stress Analysis Program JCMAC3

In this presentation, the 3-D finite element method (FEM) initial stress analysis program JCMAC3 will be introduced, which was developed by “JCI Committee on Computer Code Development for Crack Control in Massive Concrete.” The committee was established in April 2003, and has been in charge of the code development and updating for performance-based design considering initial crack due to autogenous shrinkage and drying shrinkage, not only the thermal stress. JCMAC3 of Japanese version was released in 2009, and its English version was newly released in 2021. JCMAC3 integrates with the pre/post processor FEMIS and FEMOS to make not only 3-D thermal stress analysis but also 3-D moisture transfer analysis, self-shrinkage analysis, and chemical reaction expansion analysis. The features of JCMAC3 are as follows: it enables the stress analysis by the chemical reaction expansion implementing the constant energy law, which is quite different from the initial strain method; for the calculation of pipe-cooling effects, you do not need to align the pipe with the edge of the element, and you can insert the pipe anywhere inside the element; and it is also possible to evaluate the crack spacing and crack width caused by these initial stresses. Furthermore, JCMAC3_U is also explained, which is the add-in program of JCMAC3. This add-in program makes it possible to analyze the load-bearing capacity considering the damage state by initial stresses, including cracks. In this program, the solidification theory is implemented to describe the growth of stiffness of concrete as those at the time of the material age, and a time-dependent constitutive law is introduced.

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**2nd Speaker:** Professor Takafumi Noguchi, The University of Tokyo, Dr. of Eng.

Takafumi Noguchi graduated from The University of Tokyo, Tokyo, Japan, in 1985, and received his PhD from the same university in 1995. He was an Assistant Professor at The University of Tokyo since 1988, during which he was a Visiting Scholar at the University of California, Berkeley, in 1997. He is now a Professor in the Department of Architecture at The University of Tokyo and a Project Manager of Moonshot R&D Program “C4S Research and Development Project.” He is Chair of ISO/TC 71/SC 8, Environmental Management of Concrete and Concrete Structures. He is currently President of the Japan Society for Finishings Technology and Vice President of the Architectural Institute of Japan and the Asian Concrete Federation. Noguchi is a Fellow and a 2022 Honorary President of RILEM, organizing RILEM Week in Kyoto in September 2022. He has received numerous awards, including six times Paper Prize of Japan Cement Association, the 2013 Publication Award from JSCE, the 2017 ACI Excellence in Concrete Construction Award, the 2018 Award for Outstanding Concrete Structures Winner in the Buildings Category from fib, and the 2019 Paper Prize from Japan Society of Materials Science (JSMS). He has supervised 54 PhD students. His research interests include sustainable carbon and concrete recycling, optimum supply-chain of resources and wastes in concrete, durability design and optimum rehabilitation of concrete structures, conservation of historical concrete structures, and fire resistance of buildings.

**Presentation Title:** Sustainable Carbon Recycling with Concrete “White Carbon”

CO₂ use in concrete is absolutely needed to achieve carbon neutrality in 2050. Several methods have been developed so far; for example, use of artificial carbonate as addition or aggregate in concrete, development of new cements which harden by carbonation reaction, CO₂ injection into fresh concrete, carbonation curing, and so on. During service, concrete structures can absorb CO₂ slowly, so-called carbonation. After demolition of structures, crushed concrete waste can more rapidly absorb CO₂. If we put these technologies together, can we turn concrete into carbon neutral? The answer is definitely not yes. For concrete to be carbon neutral, it shall become a sustainable material like wood. Sufficient resources must exist to make concrete, the raw materials and the products must be balanced, concrete must be completely closed recyclable, concrete must be locally produced for local use, and concrete must be produced economically. There are 2800 billion tons of CO₂ in the atmosphere. 55 billion tons of CO₂ have been emitted due to decarbonation of limestone during cement production. Annually, more than 2 billion tons are emitted due to decarbonation. CO₂ released into the atmosphere and Ca remaining in the concrete can be raw materials. They combine again to form CaCO₃, which can be a binder of new concrete, calcium carbonate concrete (CCC). If CCC is put into practical use replacing conventional cement concrete, calcium carbonate circulation system will be realized in construction. Consequently, global warming will be greatly suppressed, and the global environment will be regenerated by “White Carbon.”
Wednesday, July 13, 2022
11:00 AM-12:00 PM Bangkok Time / 12:00-1:00 AM Detroit Time
Co-Host Organization: Thailand Concrete Association (TCA)

Thailand Concrete Association (TCA) is a national professional organization to educate, share, and promote the knowledge of concrete technology.

Local Moderator: Thanakorn Pheeraphan, President, TCA

Group Captain Prof. Thanakorn Pheeraphan (Pete) has worked for the Department of Civil Engineering at Navaminda Kasatriyadhiraj Royal Air Force Academy (NKRAFA), Bangkok, Thailand, since 1997. Currently, he is the Deputy Director, Graduate School, NKRAFA. He has also been an Adjunct Faculty at the Asian Institute of Technology (AIT), Khlong Nueng, Thailand, since 1999, where he has taught and continued working on research in the area of mortar and concrete technology with graduate students. Pheeraphan received his Bachelor of Science (Distinguished) in civil engineering from Virginia Military Institute (VMI), Lexington, VA, USA, in 1991, and his Master of Science in civil engineering and PhD from Massachusetts Institute of Technology (MIT), Cambridge, MA, in 1993 and 1997, respectively. His research interests include preplaced concrete aggregate, design and inspection of airfield pavement, development of repairing material and special concrete, development of special mortar products for commercial application, and design and testing of protective structures for military applications. He has been the President of the Thailand Concrete Association since 2018. In 2019, TCA was awarded to host the 16th International Congress on the Chemistry of Cement (ICCC) in 2023 under his guidance. In 2020-2022, he has received the Siam Cement Group (SCG) Chair Professor scholarship.

1st Speaker: Binay Karna

Binay Karna received his MEng (specializing in structural engineering) (Aug. 2019 to July 2021) from the Asian Institute of Technology (AIT).

Presentation Title: Modified Andreasen & Andersen Particle Packing Optimization Method to Develop Low Cement High-Performance Concrete with Partial Cement Replacement by Fly Ash and Silica Fume

With the groom in the construction industry with rapid urbanization, the need for high-performance concrete is increasing exponentially because of its high mechanical and durability properties. CO₂ emissions related to production of cement is proving to be a big threat for the environment, because of which sustainability is a big challenge for the concrete industry. High-performance concrete with minimization of cement is a must. So, addressing this particle packing approach with partial replacement of cement with supplementary cementitious materials (SCMs) is the major objective of this work. Mixture designs have been developed using Design of Experiment (DOE) for a modified Andreasen and Andersen particle packing model, and results were compared to ACI control mixtures. Five-factor two-level central composite design DOE was with the maximum and minimum silica fume and fly ash replacements being
15 kg/m³ and 66 kg/m³ and 0 kg/m³ and 83 kg/m³, respectively. The comparison for strength and durability was done by five tests—that is, slump, compressive strength, rapid chloride penetration (RCPT), abrasion resistance, and absorption. The concrete mixtures were also analyzed for sustainability in terms of cement consumption and CO₂ emissions per MPa of concrete. Testing for the 28-day and 56-day properties, the mixture with 73% portland cement, 13% silica fume, and 14% fly ash was the most efficient one. For the mixtures, the average reduction in CO₂ emissions per MPa was approximately 30 to 40%. In addition to this, the concrete developed had good workability with average slump of 189.56 mm and very high durability (average RCPT and abrasion resistance value being 898.596 Coulomb and 0.285%). The conclusion drawn can be used to develop efficient and ecological high-performance concrete. This will contribute to significant reduction of CO₂ emissions.

2nd Speaker: Sakkarin Luangkamchorn, Construction Solution Technology Manager, The Concrete Products and Aggregate Co., Ltd.

Sakkarin Luangkamchorn has worked since 2018 as a Construction Solution Technology Manager, developing concrete and construction solutions to fulfill customer requirement with creation value. From 2004 to 2007, he worked as an Engineer in new concrete product development and application, as well as new materials and technology for using in concrete; and from 2010 to 2017, he worked as a Concrete Product Development Manager, developing new concrete product and application. Luangkamchorn received his BEng in civil engineering from Kasetsart University, Bangkok, Thailand, in 2004, and his MSc in concrete engineering and environmental management from the University of Dundee, Dundee, UK, in 2009.

Presentation Title: Low Carbon Concrete Application in Thailand

Siam Cement Group (SCG) is currently working on the project to reach the goal of Net ZERO in 2050 by initializing the project on “Low Carbon Concrete Application in Thailand” carried out by CPAC (The Concrete Products and Aggregate Co., Ltd.), one of the biggest concrete suppliers in Thailand.
Korea Concrete Institute (KCI) is an institution composed of professionals from all fields of concrete research, education, industry, and applications in the areas of concrete material, structure analysis and design, construction, repair and strengthening, and concrete-related manufacturing and production.

Local Moderator: Cheolwoo Park, PhD, Vice President, International Affairs, KCI
Cheolwoo Park is currently working for the Department of Civil Engineering, Kangwon National University, Samcheok, South Korea. He received his PhD from the University of Illinois at Urbana-Champaign, Urbana, IL, and extended his career at the California Department of Transportation (Caltrans).

1st Speaker: Sungchul Bae, Associate Professor
Sungchul Bae is an Associate Professor of architectural engineering at Hanyang University, Seoul, South Korea. He received his PhD from the University of California, Berkeley, in 2014. His research interests include the multi-scale investigations of the structure of cementitious materials using advanced characterization techniques, development of eco-friendly and low-carbon cement, application of nano-reinforcement materials for cementitious systems, fire resistance of cementitious materials, and 3-D printing cement-based materials. He was awarded the “Stephen Brunauer Award” in recognition of his outstanding contribution to the research on cement hydrates titled “Soft X-ray Ptychographic Imaging and Morphological Quantification of Calcium Silicate Hydrates (C-S-H)” from the American Ceramic Society in 2016.

Presentation Title: Roadmap of Cement and Concrete Industry to Carbon Neutrality by 2050 in the Republic of Korea
The 2050 carbon neutrality is a mission that should be pursued in a robust and consistent manner for the next 30 years. The cement and concrete industry in South Korea has committed to the goal of reaching carbon neutrality. In the presentation, a detailed roadmap outlining the opportunity and actions of the cement and concrete industry to reach carbon neutrality by 2050 in South Korea will be introduced. Near- and long-term solutions for carbon neutrality and the trend and direction of R&D in Korea's cement and concrete industry to achieve the target will be also presented.
2nd Speaker: Jong-Han Lee, Associate Professor

Jong-Han Lee is an Associate Professor in the Department of Civil Engineering at Inha University, Incheon, South Korea. He received his PhD from the Georgia Institute of Technology, Atlanta, GA, USA. His research interests include improving the functionality and performance of concrete materials and structures.

Presentation Title: Current Research for Material Development of CFRP and Expansion of Application to Structural Members in Korea

Current research for material development of carbon fiber-reinforced polymer (CFRP) and expansion of application to structural members in Korea.
Wednesday, July 13, 2022
2:00-3:00 PM Singapore Time / 2:00-3:00 AM Detroit Time
Co-Host Organization: ACI Singapore Chapter

Website: http://www.concrete.org.sg/

The ACI Singapore Chapter (ACI-SC) is a nonprofit professional body formed in Singapore in 1985. This professional body was formed with an aim to promote the usage of concrete in the local building and construction industry and to spread the knowledge related to concrete technology. ACI-SC took birth due to the efforts put in by engineers working in local concrete-related industry and academia.

Local Moderator: Dr. Guoqing Geng, Assistant Professor, National University of Singapore

Dr. Guoqing Geng is a Board member of the ACI Singapore Chapter, of Singapore Concrete Institute, and the regional convener of East Asia for RILEM. He received his master's and doctoral degrees from the University of California, Berkeley. His PhD program focused on the microscale chemistry and mineralogy of modern construction materials. He was then awarded a postdoctoral fellowship at the Paul Scherrer Institute, Villigen, Switzerland, where he studied the durability of concrete both as a construction material and hosting material for radioactive waste. He joined the Department of Civil and Environmental Engineering at the National University of Singapore in 2019. Dr. Geng’s research interests include sustainability and performance-based design of modern construction materials, as well as predicting and enhancing their long-term durability. His research involves the usage of a set of synchrotron-based characterization techniques. He has published more than 40 journal papers in the past few years, besides several conference contributions and a book chapter.

1st Speaker: Dr. Shunzhi Qian, Associate Professor, Nanyang Technological University

Dr. Qian Shunzhi is an Associate Professor at the School of Civil and Environmental Engineering and faculty staff at Singapore Centre for 3-D Printing, School of Mechanical and Aerospace Engineering, Nanyang Technological University (NTU), Singapore. He received his bachelor's from Southeast University, Nanjing, China, and his master’s from the Chinese Ministry of Transport Highway Research Institute, Beijing, China, in 1998 and 2001, respectively, and his PhD from the University of Michigan, Ann Arbor, MI, USA, in 2007. Prior to joining NTU, Dr. Qian was a faculty member at Southeast University (2009-2013) and a Postdoctoral Researcher at Delft University of Technology, Delft, the Netherlands (2007-2009). His areas of expertise include the development of advanced construction materials, such as engineered cementitious composites, self-healing concrete, and 3-D printable concrete, as well as life-cycle assessment of civil infrastructures.

Presentation Title: Material Distribution in Spray-based 3D Concrete Printing: Experimental Studies and Modelling

The adoption of 3-D concrete printing (3DCP) contributes to the increase of automation and efficiency in construction, which has the benefits of less labor investment, less waste generation, and a higher construction efficiency. Recently, spray-based 3-D concrete printing (S-3DCP) has been proposed specifically for vertical and overhanging applications, such as facades and ceiling decorations. Compared with the traditional spray technology, S-3DCP can achieve a high resolution of the sprayed profile without the need of post-processing. There are some research studies on the material development and feedback-oriented
spray-based printing systems. Nevertheless, this technology is still very premature due to the limited knowledge about how various printing parameters affect material distribution in S-3DCP.

This study tackles the issue by focusing on the effect of printing parameters—that is, pumping rate, air injection pressure, nozzle travel speed, and nozzle standoff distance. Firstly, an analytical model was constructed involving a two-stage deposition process—that is, under-compaction and full-compaction stages. The transition from the first stage to the second one occurred when the predicted section mass reached critical section mass. The widths and average thicknesses of the sprayed filament were calculated in both stages, and material distribution was described with trapezoid function. Afterward, a series of single-layer spray experiments was conducted to analyze the effect of printing parameters on material distribution and determine the constants in the proposed analytical model. Finally, the analytical model was validated by multiple-layer spray experiments. The average relative errors in predicting widths and average thicknesses were 15.29% and 9.92%, respectively, which illustrate the effectiveness of the model. The S-3DCP enhanced by the model has the potential to greatly advance the construction of vertical and overhanging decorative structures, such as customization of profiles, defect repair, and quantitative deposition of functional coatings.

2nd Speaker: Dr. Pang Sze Dai, Associate Professor, National University of Singapore

Dr. Pang Sze Dai joined the National University of Singapore in 2006 as an Assistant Professor in the Department of Civil and Environmental Engineering (CEE) and the Engineering Science Programme (ESP). He is currently working on research in protective building and sustainable building technologies using principles from biomimicry and is also researching on the size effect in cementitious and metal matrix composites. Dr. Pang has attracted multiple million dollars in research funding as Principal Investigator and Collaborator. He has served on committees for several major conferences, reviewed for multiple journal articles, and also served as external reviewer for national research projects. He has also provided his expertise to the industry for consultations on structural dynamics, steel structures, and seismic engineering. Dr. Pang is active in administrative roles as the Acting Programme Manager for the MSc (Civil) and MSc (Geotech) programs in 2008-2010, and is currently the Curriculum Coordinator for the Design-Centric Curriculum, which is delivered by the Engineering Design and Innovation Centre. He designed and taught modules for the newly set-up ESP and the fresh approach toward students’ learning was awarded the Faculty of Engineering Innovative Teaching Award. He received his PhD from Northwestern University, Evanston, IL, in 2005. For his PhD dissertation, his research was on the size effect arising from energetic and probabilistic fracture mechanics in the mechanical properties of quasi-brittle materials.

Presentation Title: Circularity in Urban Development: Excavated Waste Marine City for Cement and Filler Replacement

Abstract: n/a
Wednesday, July 13, 2022

10:00-11:00 AM Beirut Time / 3:00-4:00 AM Detroit Time

Co-Host Organization: ACI Lebanon Chapter

The ACI Lebanon Chapter consists of a group of professional people formed of contractors, consultants, suppliers and others. This chapter is a non-profit organization. The chapter activities consist of local and regional conferences, regular training courses accompanied with ACI certificates, networking, university lectures, technical assistance to its members, and many others. Competitions are held regularly encouraging the participation of different parties.

Local Moderator: Engineer Ziad Awad, Director, ACTS

Engineer Ziad Awad is a Director at ACTS, a materials testing and geotechnical engineering firm operating throughout the Middle East, India, and Africa. ACTS is also the local sponsoring group for the American Concrete Institute. He is currently managing the operations in Lebanon and Africa and managing the training and certification division in the company. He started his career with ACTS in materials testing, inspection, and quality control, where he specialized in construction materials quality control, engineering training, and project management. He is an official examiner for the American Concrete Institute in the Middle East and Africa and conducts trainings and certification examinations in the region for construction professionals. He currently serves on three ACI committees: the International Advisory Committee, the International Certification Committee, and ACI Committee C610, Field Technician Certification. Awad received his bachelor's in civil engineering from Purdue University, West Lafayette, IN, USA, and his master's in environmental systems engineering from the University College London (UCL), London, UK.

1st Speaker: Dr. Faten Abi Farraj, ACTS

Dr. Faten Abi Farraj is a Research and Development Specialist at ACTS, a leading third-party engineering firm in the MENA region and the local sponsoring group for the American Concrete Institute. She is currently managing the research and development department of the group by keeping up with the latest innovations in the construction field and by creating innovative methods to upgrade ACTS business functions and the services provided to its clients. During her PhD studies, Farraj provided scientific evidence for the Lebanese market of the feasibility of replacing natural sand with crushed sand in concrete to reduce the economic and environmental impacts of the natural sand. Her thesis was conducted in a joint program between the Lebanese University, Beirut, Lebanon, and the University of Paul Sabatier Toulouse III, Toulouse, France. She previously worked as a Consultant Civil Engineer and holds a master's degree in civil engineering from the Lebanese University and the University of Lille I, Lille, France.

Presentation Title: Replacing Natural Sand by Crushed Sand in Concrete: An Effective Response to Natural Sand Problems

Finding an alternative to natural sand in concrete becomes essential to reduce its economic and environmental problems and to avoid the negative impacts of its quality on concrete performance. In the Lebanese context, the crushed limestone sand can be considered an appropriate solution due to its good quality, abundance, and the lack of other currently effective solutions. For this purpose, a study is
conducted to give scientific evidence of this solution before being applied in the market. It aims to verify that the concrete performance could be maintained when crushed limestone sand totally replaces the natural siliceous sand in concrete. The properties of concrete mixtures incorporating normalized crushed sands without natural sand are compared to those of reference concrete containing the conventional combination of natural and crushed sand. The effects of the mineralogy, morphology, and particle-size distribution of fine aggregates on concrete properties are then evaluated. A microstructural analysis is also conducted to depict the variations at the interface between the cement paste and the different types of sand grains. Furthermore, because the reduction of the high percentage of fines during the production of the normalized crushed limestone sand could impose some industrial and economic constraints, the performance of concrete, incorporating crushed sand with a percentage of fines exceeding the limit imposed by ASTM C33, is evaluated following a performance-based approach. For fixed water-cement ratio, cement content, and coarse aggregates proportions, and for different dosages of admixture to reach the same slump value, the results prove that the concrete performance could be maintained when using the normalized crushed limestone sand conforming to the standard grading requirements or the fine crushed limestone sand with a high percentage of fines.

**2nd Speaker: Marc Plançon, CHRYSO Group**

Marc Plançon is the Deputy Director – Concrete Business Unit at CHRYSO Group. CHRYSO is an international leader in concrete admixtures and cement additives and is a part of SAINT-GOBAIN’s High-Performance Solutions (HPS) division. Plançon gained over 25 years of experience in developing and deploying innovative solutions for the construction industry: Specialty Products marketing with Lafarge Concrete and Vinci (contractor) in France; 10 years as Managing Director for CHRYSO in central Europe and North America; and 12 years supporting CHRYSO concrete business development worldwide (over 70 countries) and in charge of the deployment of CHRYSO sustainable solutions for low-carbon concrete. He is a member of several professional associations, NPCA, PCI, SPCHB, and a speaker at multiple conferences: NPCA, SCC International Conference, ITB, ICCX, and WOC. He has a master’s in business and industrial marketing INSEAD, Fontainebleau, France.

**Presentation Title: Carbon-Neutral Concrete—Challenges and Solutions Snapshot**

As the climatic impact is becoming a more important topic for most of the nations which signed the COP26 accords, many concrete and cement companies have announced their carbon reduction ambitions. Although the CO₂ reduction pace varies from one country/company to the other, many of them have clearly stated their commitment toward concrete carbon neutrality in 2050. As a result, we can observe the accelerated emergence of a multitude of new technologies targeting the reduction of carbon content in concrete. The presentation proposed will go over the consequences for the concrete industry of this construction industry’s climatic impact reduction endeavor. It will explain some of the main challenges paving the cement and concrete industry’s journey toward carbon neutrality. It will deep dive into the principles and impacts of the most recent and advanced regulations in terms of low-carbon construction, such as, for example, RE2020 in France. It will illustrate some of the realistic solutions currently implemented to reduce the carbon footprint of concrete and cement and adapt to this new market environment. In a world where raw materials scarcity becomes increasingly stringent, it will also explore the solutions for the concrete industry to promote a circular economy. Finally, it will describe the most probable paths toward carbon-neutral concrete and how they will inevitably include environmental footprint reduction beyond climatic impact.
Wednesday, July 13, 2022
10:00-11:00 AM Paris Time / 4:00-5:00 AM Detroit Time
Co-Host Organization: ACI Paris Chapter

Website: http://chapitreaciparis.com/

Created in 1994 under the auspices of the French Association of Civil Engineering, the ACI Paris Chapter is an « Embassy » for mutual benefit of increased mutual knowledge between French and European civil and construction engineers and World of Concrete, especially in North America. Its jurisdiction covers French-speaking countries in Europe (France, Belgium, Luxembourg, and Switzerland). It convenes approximately 100 attendees to the Chapter’s event every year, including designers/engineering office staff for buildings and civil structures, checkers, owners/authorities, professors, contractors, and members of the precast concrete industry. Its objectives are: to keep active in stimulating education and excellence in relation to concrete practice and standards; to facilitate dissemination of French documents to the global World of Concrete; to promote international visibility of works and technical achievements realized in French-speaking Europe; to keep small but reactive and open to international scientific advances applicable to concrete technology; and to help enable implementation of these advance by the French-speaking European engineers.

Local Moderator: François Toutlemonde, PhD

François Toutlemonde is a General Civil Engineer, Research Director, and Head of the Materials and Structures (MAST) Department of Gustave Eiffel University, France. Before being included in Gustave Eiffel University, the MAST department was part of IFSTTAR, the French Public Works Research Institute (former LCPC), where Dr. Toutlemonde has been working since 1990 and led several research projects in the field of concrete and concrete structures. He has authored over 75 peer-reviewed papers in international scientific journals and supervised 15 PhDs. He has chaired the scientific committee of four international conferences with over 300 attendees: CONSEC’07 (Concrete under Severe Conditions) in Tours; UHPFRC’2009 in Marseille; UHPFRC’2013 also in Marseille; and UHPFRC’2017 in Montpellier. He has been an expert for the French Nuclear Safety Authority since 2001 and a French delegate in European Standardization committees related to concrete and concrete structures. He has been active in elaborating the French standards for ultra-high-performance fiber-reinforced concrete (UHPFRC) from 2014 to 2018 and has been Chair of the French Standardization Committee for Concrete since January 2021. He is a member of the Scientific Board of the French Association of Civil Engineering (AFGC) and he has served as the President of the Paris Chapter of the American Concrete Institute (ACI) since 2006. He has been an expert advisor for several UHPFRC projects. Dr. Toutlemonde graduated from École Polytechnique in 1987, and École Nationale des Ponts et Chaussées in 1990. He received his PhD in 1994 in the materials and structures specialty and his research direction degree from Eastern Paris University in 2003. His research interests include shock resistance of concrete structures, durability issues of concrete structures, including alkali-silica reaction and delayed ettringite formation, and structural applications of new concrete: high-performance concrete, fiber-reinforced concrete, and above all, UHPFRC.

1st Speaker: Patrick Rougeau, PhD

Patrick Rougeau is an Engineer for construction materials and gained his doctorate in the durability of concrete in storage facilities for radioactive waste. He has 25 years of experience in the domain of R&D concerning construction materials with hydraulic binders, new types of concrete (ultra-high-performance concrete, low carbon dioxide concrete), as well as their durability (performance-based approach and modeling). He is responsible for the material and circular economy unit of CERIB (R&D center for precast industry). Rougeau is the Leader of the French standardization committee “Low carbon footprint concrete” and European Standardization Committee CEN/TC 229/WG 4, “Products which do not warrant a specific standard, and which could be referred to in specific standards.”
Presentation Title: **Evolutions in French and European Standards to Promote Lower Carbon-Footprint Concrete Solutions**

The respect for the environment, the prevention of climate change, the control of greenhouse gas emissions, and the economic management of non-renewable resources are increasing requirements for construction activities. At the European and French levels, the standardization committees carry out reflections to adapt concrete standards to this new context and these challenges. To rationally justify taking these requirements into account, and without dispensing with an integrated approach at the level of construction products or functional units resulting from the design and construction of works or parts of works, emerges the need to position the concrete material in this approach, in a technically relevant way and adapted to the information needs of the different parties. In particular, it should be ensured that “low-carbon” concrete formulas of interest to the market are not unnecessarily restricted by the standards if they also meet the essential requirements of constructive performance, safety of use, and durability. There are two main areas of development, the performance-based approach, and the deemed-to-satisfy rules evolution. At the European level, a new concrete durability concept is developed named Exposure Resistance Classes (ERC) system. This concept introduces the possibility to use a performance-based approach. The innovative ERC concept will create for the first time in the concrete sector a coherent link between feedback from long-term on-site experience, limit value for the definition of concrete mixtures, and modeling of concrete durability. At the French level, a performance-based approach is introduced in EN 206 using a new standard FD P 18-480, « Justification of the durability of concrete structures by performance-based approach ». Concerning deemed-to-satisfy rules, works are in progress at the French level to reconsider, for example, the way to use supplementary cementitious constituents in the binder.

2nd Speaker: **Drew Burns, NEU Executive Director**

Drew Burns was recently appointed as Executive Director of NEU: an ACI Center of Excellence in Carbon Neutral Concrete. The NEU Center is focused on collaborating globally to drive research, education, awareness, and adoption of the use of carbon-neutral materials and technologies in the built environment and will be developing a 5-year strategic plan to help accomplish this goal. Prior to NEU, Burns was most recently the Executive Director of the Slag Cement Association (SCA) and the Great Lakes Cement Promotion Council (GLCPC), where he worked with industry professionals to promote the use of more sustainable cementitious products like slag cement and portland limestone cement. He began working with SCA in 2017 and began his work with the GLCPC in 2020. Burns has over ten years of experience in both for-profit and non-profit organizations, focusing on development of strategic plans, marketing materials, content management, member relations, and operational management. He obtained the Certified Association Executive credential in 2019 from the American Society of Association Executives, one of the highest professional development achievements for association and nonprofit professionals. He received a Bachelor of Science: Parks, Recreation and Tourism Resources, with an emphasis in Commercial Recreation and Business, from Michigan State University in 2009.

Presentation Title: **An Overview of NEU: An ACI Center of Excellence for Carbon Neutral Concrete**

NEU is a recently-launched Center of Excellence from ACI that is focused on carbon neutral concrete. The Center envisions a concrete industry where all stakeholders have access to technologies and the knowledge needed to effectively and safely produce and place carbon-neutral concrete and concrete products in the built environment. Join NEU’s Executive Director, Drew Burns, as he discusses the plans being developed for the Center and the importance of reaching carbon neutrality in the concrete-built environment.
Local Moderator: Saman Ali Abdullah, PhD

Saman Ali Abdullah, PhD, is a Postdoctoral Researcher at the University of California - Los Angeles (UCLA), Los Angeles, CA, and a Lecturer in the Department of Civil Engineering, University of Sulaimani, Kurdistan, Iraq. He received his BS from the University of Sulaimani; his MS from California State University, Fullerton, CA; and his PhD from UCLA. He is a member of several ACI committees, including ACI Committee 374, Performance-Based Seismic Design, and ACI Subcommittees 318-H, Seismic Provisions; 318-W, Wind Provisions; and 369-F, Retrofit. Abdullah has extensive experience related to design and evaluation of tall buildings in regions of low to high seismicity.

1st Speaker: Dr. Ahmed Salih Mohammed, Civil Engineering Department, College of Engineering, University of Sulaimani, Kurdistan, Iraq

Dr. Ahmed Salih Mohammed received his BSc in building and construction engineering from the University of Technology, Baghdad, Iraq, in 2000; his MSc in civil engineering from the University of Technology, in 2003; and his PhD in civil engineering at the Civil and Environmental Engineering Department from the University of Houston, Houston, TX, in 2014. He is a Postdoctoral Fellow Researcher in civil engineering/smart materials in the Department of Civil and Environmental Engineering at the University of Houston. Mohammed has done research in the areas of materials engineering, drilling muds, and geotechnical engineering. His cutting-edge research was in developing hydraulic fracturing and smart cement for oil well application. He also developed smart drilling muds for application in the petroleum and geotechnical fields. Mohammed integrated the advances in nanotechnology, polymer technology, concrete technology, and expansive clays.

Presentation Title: Computational Models to Forecast the Long-Term Compressive Strength of Normal Strength Concrete with Waste Steel Slag as a Coarse Aggregate Replacement

Concrete is a composite material that is highly used in construction fields. Steel slag (SS) is a molten liquid melt of silicates and oxides, is a by-product of the steel-making process, and solidifies upon cooling. It is a complex solution of silicates and oxides. From an environmental standpoint and to save the environment and natural resources, steel slag recovery conserves natural resources and frees up space in landfills. Steel slag as waste materials has been used in concrete as a partial replacement with fine (sand) and coarse aggregate (gravel). A total of 338 data points were collected, analyzed, and modeled. The most effective factors affecting the compressive strength (CS) of concrete incorporated with steel slag replacement were considered during the modeling process. The cement content was ranged from 237.35 to 550 kg/m³, curing time 1 to 180 days, water-cement ratio ranged between 0.3 and 0.872, steel slag content varied between 0 and 1196 kg/m³, fine aggregate content ranged between 175.5 and 1285 kg/m³, and coarse aggregate content (natural aggregate) varied between 0 and 1253.75 kg/m³. An artificial neural network (ANN), a multi
logistic regression model (MLR), a full quadratic model (FQ), an interaction model, and an M5P-tree model were employed in this study to forecast the compressive strength of normal-strength concrete (CS ranged between 10 and 55 MPa) with steel slag aggregate replacement. Based on data from the literature, the steel slag content increased the compressive strength. According to statistical tool assessments such as OBJ function, scatter index, and Taylor diagram, the ANN model with the lowest root-mean-square error (RMSE) performed better than the other models in predicting the compressive strength.

2nd Speaker: Nzar Shaker Piro, Assistant Lecturer, Soran University, College of Engineering, Scientific Research Center, Civil Engineering Department

Nzar Shaker Piro received his bachelor’s degree at the College of Engineering, Electrical Engineering Department – Salahaddin University, Erbil, Kurdistan Region, Iraq. In 2012, he received a fully-funded scholarship from the Kurdistan Regional Government. He finished his master's degree at the Electrical and Electronic Engineering school at Newcastle University, Newcastle upon Tyne, UK.

Presentation Title: Multiple Analytical Models to Evaluate the Impact of Carbon Nanotubes on the Electrical Resistivity and Compressive Strength of the Cement Paste

In this study, four different models, including the artificial neural network model (ANN), multi logistic regression model (MLR), nonlinear regression model (NLR), and linear regression model (LR), were proposed to predict the electrical resistivity (ER) of cement paste modified with carbon nanotube. In addition, the proposed models have been tested with another set of data to confirm their reliability. Furthermore, the correlation between the compressive strength and the ER of carbon nanotubes (CNT)-based paste has also been proposed, and it is compared with correlation in the literature. For the mentioned purposes, a total of 116 data was collected and examined to develop the models, and 56 data was collected for the proposed correlation model. The most influential parameters influencing the ER of CNT-based paste were considered during the modeling process—that is, water-cement ratio (ranged from 0.2 to 0.485), CNT (varied from 0 to 1.5%), and curing time (1 to 180 days). The actual ER of the CNT-based paste mixtures has a very large scatter range from 1 to 1252 Ω·m. Based on statistical assessments, the ANN model had the best performance for predicting ER for CNT-based paste than that of the other models (LR, NLR, and MLR). In addition, based on the coefficient of determination, root mean square, mean absolute error, scatter index, and objective, the proposed correlation model gives better performance than the models provided by the literature. This is because the proposed model is built based on a wide range of data.
Wednesday, July 13, 2022
11:00 AM-12:00 PM London Time / 6:00-7:00 AM Detroit Time

Co-Host Organization:
The Institute of Concrete Technology (ICT)

Website: https://theict.org.uk/

The ICT is 50 years old this year. Its mission is to preserve and promote concrete technology as a recognized engineering discipline and consolidate the professional status of practicing concrete technologists worldwide. Its aims are to create, advance, and disseminate the science and technology of concrete, and the processes for making concrete, in both local and global contexts, through national and international partnerships and activities; to provide educational pathways to recognize and award different technical or professional qualifications in concrete technology, aligning candidates at appropriate levels of memberships that are accepted worldwide; and to ensure a positive global impact of concrete as a construction material for its quality, sustainability, reliability, and economy.

Local Moderator: Colin Nessfield, Vice President, ICT, and Technical and Product Association Manager, MPA Precast

Colin Nessfield is a Technical Manager with 39 years of experience in precast. He holds the ICT Diploma in Advanced Concrete Technology and has been an elected Council Member of The Institute of Concrete Technology for over 20 years. He was awarded Fellowship of the ICT in 2019 and is now Vice President of the Institute.

1st Speaker: Robert Lewis, FACI, FCS, FICT, Technical Marketing Manager – Silica Fume, Ferroglobe

Robert Lewis has worked in concrete technology for over 45 years—starting in ready mixed concrete and then on to high-performance concrete with silica fume. He was the Technical Marketing Manager at Elkem for 32 years before moving to Ferroglobe in 2018. He is a Fellow of ACI, The Institute of Concrete Technology, and The Concrete Society. Lewis serves on committees at the British Standards Institution and the European Committee for Standardization (CEN), he is on several ACI committees, and he has recently been appointed to the ACI Board of Direction. A key achievement of his service with both ACI and the ICT has been to drive work on the creation of the ACI-ICT Concrete Field Testing Technician Certification to European Standards, which is running very successfully in the United Kingdom, Europe, and areas of the Middle East.

Presentation Title: Practical Sustainable Concrete

This presentation looks at some of the key points made at two ICT Seminars last year – “Net Zero Concrete: Do we know where we are going?” and “Practical Sustainable Concrete.” These points give an overview of the many ways in which the industry is working toward reducing its overall carbon footprint. It is illustrated by a number of ternary and quaternary cementitious blend concretes that show we have already been working with “low-carbon concrete” for some time.
2nd Speaker: Richard Swatton, Technical Business Development Manager for Wagners Earth Friendly Concrete (EFC)

Richard Swatton has worked in the construction industry for over 25 years, with around 15 years of commercial experience in ready mixed concrete. In 2013, he began part-time study over an 8-year period at the University of Derby, Derby, UK, and the University of Leeds, Leeds, UK, culminating in a distinction grade for an MSc in advanced concrete technology, in October of last year. The dissertation on the financial viability of low-CO₂ ternary blended concretes achieved the highest mark for the year. He has since been admitted as a full member of The Institute of Concrete Technology and in January 2022 began working as a Technical Business Development Manager for Wagners EFC (Earth Friendly Concrete) in the UK.

Presentation Title: Achieving Net Zero—Are Ternary Cements the Most Viable Low-CO₂ Alternatives for Concrete Production and What are the Potential Barriers to their Implementation?

The cement industry contributes 5 to 8% of global anthropogenic CO₂ emissions. The production of portland cement requires the calcination of limestone at up to approximately 1450°C. The calcination of limestone (CaCO₃) to produce calcium oxide (CaO) causes 50 to 60% of the overall CO₂ emissions. The incorporation of SCMs, such as ground-granulated blast-furnace slag (GGBS) and pulverized fuel ash (PFA), in binary composite cements has been widely used for a number of years to reduce the clinker content and thus the cement's CaO content, so mitigating the resulting emissions. With increasing global pressure to reverse the effects of climate change, a greater demand for concrete to meet the social and economic requirements of population growth, and the potential restricted availability of these SCMs, there is a growing need to extend resources and further reduce emissions, by sourcing alternative low-CO₂ cementitious binders. A systematic review of the scientific literature was performed to assess the viability of some mitigation approaches. These alternatives were assessed in terms of their technical performance, environmental credentials, and economics. Here it is shown that subject to geographical location, multi-composite ternary cements containing GGBS and calcined clays, when combined with crushed limestone filler, can offer a viable eco-friendly alternative to portland cement for concrete production in terms of cost, performance, and environmental considerations. These effects are further improved with the incorporation of high-range water-reducing admixture. Furthermore, the price (£/kg CO₂ produced) was reduced as the compressive strengths of concrete increased, leading to the conclusion that architecture and engineering have a significant role in the future reduction of CO₂ in concrete production.
The ACI India Chapter was established on December 26, 1979, by a few enthusiastic concrete technologists with ACI for the “Development and Advancement of Good Practices in Concrete Technology” in India. Today the Chapter membership consists of over 2000 concrete professionals and organizations, including consulting civil and structural engineers, concrete practitioners, academicians, researchers, material scientists, constructors, students, and so on. We are driven by our motto, “Progress Through Knowledge.” Our Chapter is distinctly active in organizing seminars, symposiums, technical lectures, meetings, and workshops with the participation of experts in the field and associated professional bodies.

Local Moderator: Sunny Surlaker, Director of the Institute for International Talent Development

Sunny Surlaker currently heads the Technical Services and R&D Division for Assess Build Chem Pvt. Ltd. and is the Director of the Institute for International Talent Development, a training organization specializing in construction-related training. He worked for over 12 years internationally in the field of building chemicals (across the United States, Europe, Brazil, the Middle East, and India). He is a Fellow of Association of Consulting Civil Engineers (ACCE) and an active member of ACI, The Institution of Engineers (India), Indian Concrete Institute (ICI), Indian Society of Structural Engineers (ISSE), and India Chapter of the American Concrete Institute. He is President of India Chapter of ACI, a Managing Committee Member at ICI – Mumbai, and Editor of Concrete India – Journal of IC-ACI. He is also a member of ICI Committees for Handbooks on Admixtures and Waterproofing. He received his BE (civil) from Veermata Jijabai Technological Institute (VJTI), Matunga, Mumbai, India, and his masters (civil) from the University of Michigan.

1st Speaker: Dr. Sivakumar Kandasami, Deputy General Manager (Civil), Larsen & Toubro Limited

Dr. Sivakumar Kandasami is a Deputy General Manager with the Buildings and Factories IC of L&T Construction in Chennai, India. A civil/structural engineer, he is a specialist in concrete technology and practice having substantial experience in concrete durability design for a variety of infrastructure, including assessment-cum-substantiation of civil nuclear facilities. He is a Fellow of The Institution of Engineers (India), and The Institute of Concrete Technology (ICT), UK. Kandasami is a member of ACI, ASTM International, and the Indian Concrete Institute (ICI), with involvement in various technical committees. Further, he represents L&T Construction in the General Council of ICI and represents India in the Council of ICT. A strong exponent of concrete technology, he has delivered several invited lectures for academia and examined several graduate theses at the Indian Institute of Technology Madras, Chennai, Tamil Nadu, India, and Anna University, Chennai, Tamil Nadu, India. He has contributed to the Editorial Board of Journal of Testing and Evaluation (ASTM International, 2009 to present), Construction Materials (ICE, 2018 to present), and Civil Engineering (ICE, 2010 to 2016). Furthermore, he reviews manuscripts for several journals, including ACI Materials Journal and ACI Structural Journal. He is a member of the Technical Board of the ICI. Kandasami is a recipient of the ORS Award (UK universities) and MCR Award (ICE, UK). He received his PhD from the University of Dundee.
Presentation Title: **C&D Waste for Sustainable Concrete Construction**

With India set to overtake several developed nations as a large economy, the construction industry is poised for a new phase of rapid growth alongside deployment of digital technologies. For the upcoming infrastructure, as ever, concrete being the favored material of choice in various forms, characteristics, and performance, the ingredients to make concrete are in huge demand and are in short supply. This demand entails not only increase in cost of construction but also creates huge pressure on natural resources—difficult to sustain forever. As India moves to a circular economy, it is important to carefully examine the life cycle of the concrete, and any dismantled concrete should be recycled and pulled back into the system for use as aggregates reducing the embodied carbon of concrete. This presentation looks at the developments happening in India on the use of recycled aggregates in construction.

2nd Speaker: **Dr. Manu Santhanam, Professor, Department of Civil Engineering, IIT Madras**

Dr. Manu Santhanam is a Professor in the Department of Civil Engineering, Indian Institute of Technology (IIT) Madras. After more than 2 years with Sika Corporation, USA, as an R&D Chemist, he went back to Purdue University for his PhD, which was completed in 2001, on the topic of sulfate attack of concrete. He joined IIT Madras soon after the completion of his PhD. Santhanam specializes in research on cementitious materials from an interdisciplinary approach, wherein sophisticated analytical techniques from chemistry and materials science are used to explore the link between microstructure and performance of cement-based materials. The primary focus of Santhanam’s research has been the performance of concrete prepared with supplementary cementitious materials. The gamut of investigations conducted in various research projects on this aspect include the understanding of fresh state properties such as rheology and setting, as well as hardened state characteristics including strength and durability. The development of pore structure and its impact on the early and long-term properties of cementitious systems modified by supplementary materials is a recurring theme in the projects executed by Santhanam’s group. He has published more than 150 papers in peer-reviewed journals and conferences and is on the Editorial Board of *Cement and Concrete Composites*, *ASCE Journal of Materials in Civil Engineering*, *Journal of Sustainable Cement-Based Materials*, and *Advances in Cement Research*. He obtained his BTech from IIT in 1994 and his MS and PhD from Purdue University in 1996 and 2001, respectively.

Presentation Title: **Utilization of Limestone Calcined Clay Combination as Supplementary Cementing Material to Reduce CO₂ Footprint of Concrete**

The presentation focuses on the processing and use of blends of limestone and calcined clay as high-volume replacements for clinker in ternary blended cementitious systems. The alteration in hydration chemistry brought about using such materials leads to a denser microstructure with very little interconnected porosity. This leads to a very high level of durability of concrete with such binders, especially in a chloride environment. The resultant impact on sustainability indicators like CO₂ emission and energy consumption is also very positive.
The ACI Italy Chapter is the Italian section of the American Concrete Institute, one of the most important associations in the world in developing knowledge and practice in concrete materials and structures. The Chapter pursues many objectives, including dissemination of scientific research and organization of educational events promoting useful relationships between academic and industrial representatives. The scientific divulgation takes place through publications, conferences and conventions, workshops, educational courses, awards, and any other suitable initiatives. These activities aim at collecting, developing, and promoting knowledge to improve design; development of new construction cementitious-based materials and techniques; conservation and maintenance tools for existing reinforced and prestressed concrete buildings and infrastructures. The ACI Italy Chapter was founded in 2003 by some eminent personalities of academic and industrial institutions. The first President was Mario Alberto Chiorino, Professor Emeritus of the Polytechnic University of Turin, Turin, Italy, Honorary President of the Chapter. The current Board of Directors was elected in April 2021: Prof. Luigi Coppola (University of Bergamo, Bergamo, Italy) and Prof. Liberato Ferrara (Milan Polytechnic, Milan, Italy) are the President and Vice President, respectively. ACI Italy Chapter has approximately 70 individual members and 43 student/young members. The ACI Italy Chapter’s by-laws consider individual, sustaining, and student membership.

Local Moderator: Gennaro Magliulo, Associate Professor, University of Naples Federico II

Gennaro Magliulo has been an Associate Professor since 2018 in the Department of Structures for Engineering and Architecture at University of Naples Federico II, Naples, Italy, where he teaches two master's degree courses: Precast Structures and Healthcare Facilities. Since 2016, he is an Affiliate Researcher at the Construction Technologies Institute of the National Research Council. In 2001, he had a 6-month postdoctoral position at the University of Ljubljana, Ljubljana, Slovenia, and between 2001 and 2002 he was a Visiting Researcher at Technion, Haifa, Israel. He is currently tutor of three PhD students and he has tutored seven PhD students, six in the frame of the doctorate in Seismic Risk and one in the frame of the doctorate in Engineering of Materials and Structures. He also taught the course of Seismic Analysis of Buildings within the doctorate in Seismic Risk. He is currently member of the Board of doctorate professors of the doctorate in Biology and Applied Sciences at the University of Molise, Campobasso, Italy. He is author of six patents and more than 200 articles, 50 of them published by international peer-reviewed journals. His research concerns earthquake engineering and dynamics of structures, nonstructural components, reinforced concrete structures, and precast structures, in the fields of theoretical modeling, numerical analysis, experimental research, and code activity. Magliulo has been principal investigator of 25 international and national research projects, funded by either public or private entities. He is Founder and member of the ACI Italy Chapter Board and of the “Seismic Performance of Nonstructural Element” association, and member of the fib committee TG 6.17 “Retrofitting and repairing of precast structures in seismic areas.” He is also a member of ACI, and of the European Association for Earthquake Engineering (EAEE). He received his degree in civil engineering, branch structures, in 1997 with laude and received his PhD in engineering of structures in 2001.

1st Speaker: Liberato Ferrara, Associate Professor

Liberato Ferrara is an Associate Professor of structural analysis and design and holds the Italian National Qualification to full professor. He has been a Fulbright Visiting Scholar at the Center for Advanced Cement-
Based Materials, Northwestern University, and is a Visiting Professor at Beijing Jiaotong University, Beijing, China. He is currently Chair of ACI Committee 544, Fiber-Reinforced Concrete, and a member of ACI Committees 130, Sustainability of Concrete; 237, Self-Consolidating Concrete; 238, Workability of Fresh Concrete; 239, Ultra-High-Performance Concrete; 241, Nanotechnology of Concrete; and Joint ACI-ASCE Committee 446, Fracture Mechanics of Concrete. Ferrara is a member of technical committees in RILEM and fib as well. He has been the recipient of the ACI Delmar L. Bloem Distinguished Service Award for outstanding chairmanship of ACI Committee 544. His research interests include the material concept, experimental characterization, modeling, and structural applications of advanced cement-based materials, with special focus on durability and sustainability and on advanced manufacturing technologies, including 3-D printing and the use of artificial intelligence (AI) algorithms in civil engineering applications.

**Presentation Title:** The Sustainability of the Concrete Construction Industry: Contributions by the Italian Value Chain

More than one century after its massive introduction in the building industry, concrete is still the most popular building material, and this is simply because if we try to replace concrete with any other construction material, it will result in a higher carbon footprint. Sustainability of the concrete construction industry requires a holistic approach which moves from the material concept and design, and hence the production of its constituents, to the concrete design and production, to the structural design use and maintenance. This talk will highlight how these single contributions have been tackled by the industrial partners of the ACI Italy Chapter, covering the whole value chain of the concrete construction industry and how they can be merged into a consistent assessment framework.

**2nd Speaker:** Luigi Coppola, Associate Professor, University of Bergamo

Luigi Coppola is a Civil Engineer, Associate Professor at the University of Bergamo, Department of Engineering and Applied Sciences, and President of the ACI Italy Chapter. He has authored more than 330 original papers and 21 books on admixtures for concrete, alternative low-carbon binders, waste management in concrete production, deterioration, durability and repair of concrete structures, mixture-design, deterioration and restoration of historical buildings, and corrosion and protection of reinforcing bar in reinforced concrete structures. In June 2000, Coppola was conferred an award for the “Outstanding and Sustained Contributions to Enhance the Durability of Concrete” by the American Concrete Institute (ACI) and the Canadian Institute of Materials, Energy and Transportation (CANMET). He is an editor and member of many international journals, and he is the Chairperson of the Thirteenth International Conference on Superplasticizers and other Chemical Admixtures in Concrete—Milan, Italy, June 5-8, 2022, and Fifteenth International Conference on Recent Advances in Concrete Technology and Sustainability Issues—Milan, Italy, June 8-10, 2022.

**Presentation Title:** Perspective Pathways for Zero Carbon Footprint Concrete

In recent years, the increase in the sustainability of building materials has become essential to preventing climate change caused by global warming. The use of construction materials defined as “sustainable” cannot be based exclusively on environmental parameters related to the production of mortars and concretes, such as the energy consumption, the natural raw materials consumption, and the greenhouse gas emissions, but should also consider the performance and the durability of the mixtures used during the construction of structural elements and secondary building components. The topic is particularly complex and requires a multidisciplinary approach that ranges from the development of new solutions for the production of binders and aggregates to the optimization of the production processes of portland cement clinker and to the improvement of waste management to transform slags and industrial by-products into a sustainable resource. Therefore, this keynote deals with the environmental impact of the concrete industry and it highlights the best paths to improve the sustainability of cementitious materials, considering the reduction of environmental impact, the improvement of performances, and the prolonging of service life of reinforced concrete structures. In particular, several strategies have been proposed: from the new technologies to improve the efficiency of cement plants (including the carbon capture, use, and storage systems) to the partial replacement of portland cement with supplementary cementitious materials, passing from the use of alternative “green” constituent (binders, aggregates, and water) and the addition of admixtures for high-durability/high-performance concretes.
Wednesday, July 13, 2022
3:00-4:00 PM Lausanne Time / 9:00-10:00 AM Detroit Time

Co-Host Organization: Fédération internationale du béton (fib)

Website: https://www.fib-international.org/

The fib – International Federation for Structural Concrete/Fédération Internationale du Béton – is a not-for-profit organization committed to advancing the technical, environmental, and economic performance of concrete structures worldwide. The association was founded in 1998 through the merger of the CEB (Comité euro-international du béton; founded in 1953) and the FIP (Fédération internationale de la précontrainte; founded in 1952). At present, fib is formed by 41 national member groups in 104 countries and approximately 1000 corporate and individual members. The fib's mission is to study and disseminate at an international level the scientific and the practical advances relevant for concrete structures in the principal areas of fib activity: structural materials, structural design and assessment, durability and sustainability, production and execution, and education and publications. A central aspect within the mission of the fib is the release of Model Codes on concrete structures and related subjects. These codes should serve worldwide as the guiding science-based documents offering in a code-type version the state-of-the-art knowledge on the planning, design, construction, execution, operation or in-service performance, maintenance, rehabilitation, and dismantlement of new and existing concrete structures, respectively. The knowledge developed and shared by the fib (fib Model Codes, fib Bulletins, fib events, fib workshops, fib courses, and so on) is entirely the result of the volunteer work provided by the fib members.

Local Moderator: Agnieszka Bigaj, Senior Scientist, TNO Unit Buildings, Infrastructure & Maritime

Dr.ir. Agnieszka Bigaj-van Vliet is a Senior Expert in the field of safety and durability of concrete structures. She received her MSc in civil engineering from Warsaw University of Technology, Warsaw, Poland, and her PhD in civil engineering from Delft University of Technology, and has been working for over 20 years at the Netherlands Organisation for Applied Scientific Research. Bigaj-van Vliet is involved in high-end consultancy projects of TNO, in infrastructure domain, and coordinates several research programs at TNO, including research on smart and sustainable concrete structures with circular solutions based on recycling and reuse of construction demolition waste and research on data-informed assessment of concrete bridges supported by structural health monitoring and probabilistic numerical analysis. Presently she is coordinator of the Horizon 2020 EU research project IM-SAFE, which is aimed to formulate input for a mandate to the European Committee for Standardization (CEN) to prepare a new standard in monitoring for optimal maintenance and safety of transport infrastructure. She is a Presidium member of the fib, a member of the fib Technical Council, and head of the Dutch National Delegation to fib. She is co-convener of the fib TG10.1 Model Code for Structural Concrete. She is also a member of ACI Subcommittee 318-L, International Liaison, and of ACI Committee 318, Structural Concrete Building Code.

1st Speaker: Em. Professor Joost Walraven, Delft University of Technology, the Netherlands

Em. Professor Joost Walraven was a Professor of concrete structures at Delft University of Technology (TUD) from 1990 to his retirement in 2012. He carried out research on modeling the behavior of concrete structures under various conditions and on the development of new innovative types of concrete. He was President of fib in the period 2000-2002 and convener of the fib Special Activity Group for Model Code 2010. He was convenor of the Project Team for producing the actual Eurocode for Concrete Structures edited in 2004. Moreover, he was Chairman of the fib Task Group “Modelling the Behaviour of Existing Concrete Structures.” Since 2012, he has been a Professor Emeritus at TUD and a Consulting Engineer.
Presentation Title: **Assessment of Existing Structures Experiencing Deterioration**

In the past, concrete structures were designed for structural safety and serviceability. Durability was generally not an issue. Meanwhile, we have learned from experience that this was a wrong concept; many structures suffer from deterioration, which has given rise to a number of essential questions: is the structural safety still sufficient, and if yes, for which period can this be guaranteed? And if the structure should be strengthened, how should this be done? To answer those questions, we have to know more about the state of the structure considered: its actual condition, its deficiencies, and the expected rate of further deterioration in time. A basic question is also whether we can use our design rules in codes for the evaluation of structural safety of deteriorated structures by just introducing deterioration factors, or whether we need more advanced, tailor-made models for any type of deterioration. In the *fib* Model Code 2010 the principle of “Levels of Approximation” was introduced: simple formulations were given for the determination of structural resistance, but also more advanced formulations, requiring more skill and more effort to determine the residual bearing capacity of existing structures. But here the question remains how to handle uncertainties, like related to the input values of the properties of the deteriorated materials. The effects of various types of deterioration are regarded, like alkali-silica reaction, corrosion of reinforcement, freezing-and-thawing effects, and sulfate attack. Regarding corrosion of the reinforcing steel, different types of deterioration have to be taken into account, such as uniform corrosion and pitting corrosion. In the last case, not only the cross-sectional area of the reinforcing bars is reduced but also their ductility, which should be regarded in the assessment. In the *fib* Model Code 2020, now in development, models are given for the determination of the actual condition of deteriorated structures and their residual service life.

2nd Speaker: **Dr. Jean-Michel Torrenti, Researcher at Université Gustave Eiffel, Professor at École nationale des ponts et chaussées**

Dr. Jean Michel Torrenti is a Researcher in the Department of Materials and Structures at the Université Gustave Eiffel. He is also a Professor at École nationale des ponts et chaussées. His research interests include mechanics of concrete and its coupling with durability and sustainability aspects: behavior of concrete at early-age, creep, and leaching, and is applied to model the behavior of structures such as bridges, nuclear power plants, and nuclear waste storage; recycling; and low-carbon concrete. He is co-author of several papers and books concerning concrete and concrete structures. He is head of the French Delegation and convener of COM4 (materials) of the *fib*.

Presentation Title: **Low Carbon Concrete is Not Only Low Carbon Cement**

The cement contribution to the concrete CO₂ footprint is around 98%. So, the first idea to reduce the carbon footprint of concrete is to reduce the one of cement. Indeed, improvements could and should be made in the production of clinker cement and in the use of supplementary cementitious materials to reduce the part of clinker in the cement. Then, the concrete mixture design must be optimized considering the environmental exposure classes. But, when a concrete structure is considered, the choice of concrete with the lowest footprint per cubic meter is not always the best solution. Design engineers also have to integrate into the design of the concrete structures the environmental impact because the way they design these structures matters. In conclusion, to obtain a net-zero concrete, all the stakeholders must be involved.
Wednesday, July 13, 2022
4:00-5:00 PM Warsaw Time / 10:00-11:00 AM Detroit Time

Co-Host Organization: Committee of Civil Engineering of the Polish Academy of Sciences (CCE PAS)


The Committee of Civil Engineering of the Polish Academy of Sciences (CCE PAS) was established on October 30, 1951. The main research areas of CCE PAS are concrete structures; steel structures; loads acting on the object; interaction of the object with the ground; building materials; insulation systems; heating, ventilation, water, and energy supply systems; sanitary systems; hydrotechnical structures; road and bridge engineering; technical infrastructure of cities; and organization and planning of construction processes. The Committee coordinates cooperation with international organizations such as the American Concrete Institute (ACI); the International Federation for Structural Concrete (fib); and the International Union of Laboratories and Experts in Construction Materials, Systems and Structures (RILEM). The Committee has been continuously publishing the quarterly journal *Archives of Civil Engineering* and an irregular series called the *Study of Civil Engineering*. The strength of the Committee’s activity is located in its sections. Currently, there are 11 sections covering the whole range of the Committee’s competence and all section Chairs are members of the Committee. One of the Committee’s major tasks is to disseminate science and conferences, seminars, symposia, and congresses serving this purpose. The Committee and its sections are co-organizers or patrons of these events. The members of CCE PAS are also members of the scientific committees of conferences to take care of the substantive level of the papers. Two national conferences are organized under the direct patronage of the Committee: the annual scientific conference in Krynica (which had its 65th anniversary in 2020) and the scientific and technical conference, Structural Failures, held every 2 years in Międzyzdroje (which will have its 30th anniversary in 2022).

**Local Moderator:** Professor Maria Kaszynska

Professor Maria Kaszynska, PhD, DSc was a Professor and Dean from 2012 to 2020 of the Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology, Szczecin, Poland. She is a member of the Committee of Civil Engineering (KILiW) of the Polish Academy of Sciences (PAN), and a member of the KILiW section of Concrete Structures. She is Chair of the building materials section of the Committee of Civil Engineering of the Polish Academy of Sciences, where she serves as the ACI Liaison with that Committee. She is a member of the ACI International Advisory Committee and is Chair of the Scientific Committee of the Polish Society of Civil Engineers (PZITB). Professor Kaszynska is a member of the Scientific Committee of Building Research Institute in Warsaw (ITB). Her area of expertise includes concrete technology, material properties, high-performance concrete; self-consolidating concrete, early-age properties of concrete, hydration heat; and the effect of admixtures and additives on properties of concrete. She has organized biannual conferences on structural failures since 1994. These conferences have become major events with attendance of over 500 participants representing design and construction companies, as well as research institutions and government agencies.

**1st Speaker:** Professor Lech Czarnecki, PhD, DSc

Professor Lech Czarnecki, PhD, DSc, is a well-known scientist and internationally renowned expert in building materials engineering. He is the Scientific Secretary of the Instytut Techniki Budowlanej (ITB) Building Research Institute, Warsaw, Poland. He was the President of International Congress on Polymers in Concrete
Presentation Title: Sustainable Building Construction; In Search of the Promethean Transformation

This contribution is a critical analysis of the role of thermodynamic factors in shaping the sustainable development in building engineering. The actual challenges are presented in the example of concrete and cement—the most commonly used materials. It has been found that the development of concrete technology occurs by modification, not by substitution. Considering the data supplied by the Polish cement industry, it is possible to reveal that the changes in the field of technology, aimed at the reduction of energy consumption for cement clinker production, replace the thermodynamic barrier of the process as a whole. In this contribution, the critical opinions relating to the possibility of Promethean evolution mentioned previously are also presented. However, in many reports, there is an idea that only these changes could generate a step change in the development of humanity.

2nd Speaker: Maciej Zajac, Dr. Sc. Eng.

Dr. Maciej Zajac is a Principal Scientist in the Global Research and Development Department of Heidelberg Cement, one of the largest building materials companies in the world headquartered in Heidelberg, Germany. He leads research efforts to develop innovative and sustainable products as a contribution to climate protection, and to generate added value for customers and the company. Zajac received his PhD in physical chemistry at the University of Burgundy, Dijon, France, in 2007 and then moved to Heidelberg Cement as a Junior Scientist. As a Principal Scientist, Zajac supports and leads multiple key research and development projects including collaboration with external partners. He oversees everything from planning, execution, monitoring, and closing projects to researching and understanding the latest technological advances. He recently acquired the qualification for lecturing in higher education (“Habilitation”) at AGH University of Science and Technology, Kraków, Poland, on “thermodynamic modelling in cement science: case study on novel production process and novel supplementary cementitious material based on the recycled, carbonated cement paste.” His research interests include mechanisms of the hydration and carbonation reactions involved in cementitious materials. He contributed to more than 50 papers in peer-reviewed scientific journals and is co-author of more than 20 patents.

Presentation Title: CO₂ Mineralization in Cement and Concrete Industry

Production of portland clinker is inherently associated with CO₂ emissions originating from limestone decomposition and the irreplaceable large-scale source of calcium oxide needed. Besides carbon capture and storage, CO₂ mineralization is the important lever to reduce these process emissions. CO₂ mineralization is a reversal reaction to clinker production; CO₂ is bound into stable carbonates in an exothermic process. It can be applied in several environmentally and economically favorable ways at different stages of clinker, cement, and concrete life cycles. These possibilities are assessed and discussed in this contribution. The results demonstrate that when combined with concrete recycling, the complete circularity of all its constituents, including the process CO₂ emissions from the clinker, can be achieved and the overall related CO₂ intensity significantly reduced.
The Norwegian Concrete Association (NCA) is a professional society with 1310 members including personal members, student members, and companies from all parts of the industry. NCA offers courses in a wide range of topics, from safety courses for concrete drivers to advanced concrete engineering. NCA publications and reports are recognized and serve as important supporting documents for standards. Their young members group is very active and arranges local networking events. They are also active in different NCA committees and working groups. NCA also arranges conferences, seminars, and webinars. This June, they hosted the *fib* international congress in Oslo, Norway.

**Local Moderator:** Cecilie Hagby, Managing Director of NCA

Cecilie Hagby received her MSc in engineering geology from the Norwegian University of Science and Technology (NTNU), Trondheim, Norway, in 1990. She has been the Managing Director of the Norwegian Concrete Association for the last 3 years. She previously worked as the CEO of Svelviksand AS, a large producer of concrete aggregate in the metropolitan area in Norway, for 12 years. Hagby also worked as the Quality System Auditor for Kontrollrådet for 12 years. Her research interests include concrete aggregates.

**1st Speakers:** Krzysztof Wojslaw, Sweco, Norway, and Ulvestad Oystein, Sweco, Norway

Krzysztof Wojslaw received his master's degree in structural engineering. He is currently a Structural Bridge Engineer at Sweco, Norway. He is a specialist in parametric design, virtual design, and construction. Wojslaw was the winner of the European Federation of Engineering Consultancy Associations (EFCA) Future Leaders in 2021 and winner of Norwegian Association of Consulting Engineers (RIF) Young Consultant in 2020.

Ulvestad Oystein received his master’s degree in structural engineering from NTNU in 2000. He is currently the Building Information Modeling (BIM) developer at Sweco, Norway. Ulvestad specializes in model-based projecting, drawingless design, and parametric design of concrete bridges. This includes the BIM model for the world's first concrete bridge built without drawings.

**Presentation Title:** *A Construction Site without Paper Drawings: How to Use Parametric Design and 3D Modelling to Optimize Constructions—A Case Study from Randselva Bridge in Norway*

With the use of parametric design, the Randselva Bridge in Norway has been optimized regarding material, design, and location. The bridge is 3-D modeled and, with the use of advanced BIM systems, the construction is executed without paper drawings. In this presentation, Ulvestad and Wojslaw will go through the process of the parametric design and also show how BIM has been used as a tool in the process. Examples from the Randselva Bridge project will be given.
2nd Speaker: **Truls Krossøy, MSc, Concrete Technologist**

Truls Krossøy is a Concrete Technologist at Ølen Betong, one of the largest concrete producers in Norway. His main field is a mixture of design, quality control, and environmental product declarations (EPD). He has been involved in several large projects where project specific EPDs and the use of concrete mixture with slag cement or fly ash cement has lowered the carbon footprint of construction to a minimum.

**Presentation Title: How to Minimize Carbon Footprint by Using EPD, LCA, and Ultra-Low-Carbon Concrete—A Case Study**

In Norway, the use of project-specific, in contrast to generic, environmental product declarations (EPD) and life-cycle assessment (LCA) to calculate and optimize the carbon footprint of construction has been proven successful. Different concrete mixtures and different materials and designs can be compared to find the most optimal solution in a life-cycle aspect. In this presentation, Krossøy will give a project example of how the use of an ultra-low-carbon concrete mixture with slag cement has lowered the carbon footprint on the Vestlandet College project without compromising on quality or execution.
The Spanish Association of Structural Engineering (ACHE) is a nonprofit association formed by technicians interested in structural engineering, both in the development of knowledge and in its application in real construction projects. ACHE seeks to promote any advances regarding structures whether scientific, technical, economic, or aesthetic and serve as a channel for Spanish participation in similar international associations. The members of ACHE are engineers and architects who develop professional activity in administration (central, regional, municipal) in private companies (consultant, construction, control) or in academia. The origin of ACHE dates back to 1949 when the Spanish Technical Association of Prestressed Structures (ATEP) was founded. In 1999, ATEP merged with the Spanish Concrete Group (GEHO) to create ACHE.

Local Moderator: **Antonio Martínez-Cutillas, President, ACHE**

Antonio Martínez-Cutillas received his MSc in civil engineering from the Technical University of Madrid, Madrid, Spain, in 1987, and his PhD from the same university in 1993. He has been an Associate Professor since 1997. He has been working for Carlos Fernández Casado, S.L., since 1987 on bridge design and analysis. His research interests include the dynamic behavior of bridge abutments. Martínez-Cutillas has experience in the design of prestressed concrete bridges and composite steel-concrete bridges. He has been involved in more than 50 projects, most of which have been built. He is currently involved in the design and construction of two long-span cable-stayed bridges in North America: the Gordie Howe International Bridge between Windsor, ON, Canada, and Detroit, MI, USA, with an 840 m main span, and Harbor Bridge with a 504 m main span located in Corpus Christi, TX, USA.

1st Speakers: **Luis Amorín, Global Head of Open Innovation, Luis Martín-Tereso, Bridge Design Manager at Engineering Services, and Alfredo Rodríguez, Head of Quality & Environment Dept.**

Luis Amorín received his degree in civil engineering from the Instituto Superior Técnico, Lisbon, Portugal, and is a senior member of Ordem dos Engenheiros. A successful leader with over 25 years of experience, he has managed large, multi-disciplined teams within complex infrastructure projects (for example, Crossrail, HS2). Amorín has always led by example, striving to achieve the highest standards in health, safety, quality, and environmental performance using innovation and sustainability as its main levers. In his role as Global Head of Open Innovation, he brings all his knowledge and experience to drive Ferrovial Construction’s efforts to engage the wider innovation ecosystem, namely in sustainable infrastructure.

Luis Martín-Tereso is the Bridge Design Manager at Ferrovial Construction. His main goal consists of developing competitive and sustainable infrastructures to projects where Ferrovial is involved at different stages (tender, preliminary and detailed design, and construction and maintenance advice). He received his MSc in civil and structural engineering from the Polytechnic University of Madrid, Madrid, Spain, and has more than 20 years of experience. Recent outstanding projects where he has been involved include Bratislava Danube Crossing (D4R7) and Toowoomba Second Range Crossing (Queensland, Australia). He is also an Engineer of some Ferrovial in-house design projects such as La Vicaria Arch Bridge, Barranco de La Batalla Viaduct, and San Carlos Viaduct, among others in Spain. He has a passion for bridges and the historical evolution of their design.
Alfredo Rodríguez is a Civil Engineer from the Politechnic University of Madrid, with 25 years of experience. He has developed his professional career at several companies. Initially, he started in construction as a Project Manager but has subsequently focused his activity on quality and environmental management systems. He is currently the Global Head of Systems 9001 / 14.001 of Ferrovial Construction at the international level. He leads the multi-site certification processes involving all the countries where Ferrovial Construction is located, monitoring system performance and reporting to stakeholders.

**Presentation Title: Sustainable Actions in Concrete Structures**

This presentation introduces trends in the construction sector on sustainability issues. It presents the scenario in countries in which the company is operating, highlighting the United Kingdom (UK) as one of the leading locations in environmental aspects. A couple of case studies will be discussed related to the D4R7 Project and the Prievoz Interchange refurbishment in Bratislava. This experience has made it possible to recover existing structures while optimizing the consumption of resources. Padornelo Tunnel AVE project is a great example of circular economy, recycling excavation material from tunnels to prepare concrete lining and reducing waste generation.

**2nd Speaker: Carlos Thomas, Associate Professor, PhD**

Carlos Thomas is an Associate Professor at the Laboratory of Materials Science and Engineering, Santander, Spain, and Chair of the research area at the Environmental and Civil Engineering School of the University of Cantabria, Cantabria, Spain. He received his international PhD (cum laude) as well as the Extraordinary Doctorate Award. His research interests include the valorization of construction, demolition, and industry wastes for the manufacture of recycled mortars and concrete. In previous years, he has participated as the Principal Investigator and a Researcher in several projects, with both public and private funding, related to recycled materials. He is the author of a JCR paper certified as one of the 25 most downloaded in ScienceDirect four times and two highly cited papers (Clarivate, 2021). He is Chair of the Scientific Committee of the International Structures Congress (ACHE) and Plenary Speaker or communicator in several congresses and conferences. He has undertaken research stays in France (Socrates-Erasmus program), Germany (Leonardo Program), Brazil (Banco Santander program), and Portugal (José Castillejo program). Thomas is the Associate Editor of the *Journal of Building Engineering*, Board Editor of *Applied Sciences* and *Heliyon*, and Guest Editor of the special issues: “High-Performance Eco-Efficient Concrete,” “Advances in High-Performance of Eco-Efficient Concrete,” “High-Performance of Eco-Efficient Concrete, Volume 3,” and “Repair Materials for Existing Structures.” He is Editor and Co-Editor of the books *Waste and Byproducts in Cement-Based Materials*, *The Structural Integrity of Recycled Aggregate Concrete Produced with Fillers and Pozzolans*, and *Construction and Building Repair Materials*.

**Presentation Title: Siderurgical Aggregates as Alternative for Structural and High-Performance Concrete**

New and useful applications must be found for novel sustainable building materials. Concrete with sustainable materials, far from reaching their maturity, are in a stage of development that will foreseeably end with their acceptance within future regulations. The current trend in the development of self-consolidating concrete with recycled materials has served as a guide to design a novel self-consolidating concrete with siderurgical by-products (steel slag aggregates and cupola slag powder as supplementary cementitious material) which also meets the demands of high-performance concrete. This presentation sets out to clarify the unknown behavior of slag concrete and its durability, understood as the ability to withstand any process that tends to deteriorate it. To assess the durability of this eco-friendly concrete, control mixtures were made with the same high-quality coarse aggregate but different fine aggregates, limestone filler, fly ash, and cupola slag powder. All the mixtures were subjected to the same tests and the results demonstrate that steel slag concrete shows an excellent response to carbonation, a slightly lower response to thermal shock cycles, similar drying shrinkage, and a superior response to the action of freezing-and-thawing cycles and abrasion wear in comparison to the control mixtures.
Wedneday, July 13, 2022
1:00-2:00 PM Santiago Time / 1:00-2:00 PM Detroit Time
Co-Host Organization: Instituto del Cemento y del Hormigón de Chile (ICH)

The Instituto del Cemento y del Hormigón de Chile (ICH) is a technical institution founded by the Chilean Construction Chamber and the cement industry with the mission to promote and improve knowledge and use of concrete in all its applications.

**Local Moderator: Fernando Yanez, PhD, Universidad de Chile, Past President of the Chilean Structural Engineers Association**

Fernando Yañez, PhD, is Civil Engineer and member of the Board of ICH. He is also Director of IDIEM at the Universidad de Chile, Santiago, Chile, and Past President of the Chilean Structural Engineers Association. He is also member of the American Concrete Institute (ACI) and has served in numerous ACI committees for more than 30 years.

**1st Speaker: Professor Leonardo M. Massone, PhD, University of Chile**

Leonardo M. Massone is a Professor at the University of Chile in the Civil Engineering Department. He received his BS from the University of Chile, and his MS and PhD from the University of California, Los Angeles, Los Angeles, CA. He teaches concrete design, advanced concrete design, and nonlinear analysis of structures. His research interests include analytical and experimental studies of reinforced concrete systems, with emphasis on seismic response. He has written more than 40 articles indexed in WoS (Web of Science). Massone has received national recognition from the Chilean Institute of Engineers (2014) and international recognition when he received the “Young Professor Best Paper Award” at the 36th Conference on Deep Foundations (United States, 2011), the “Best Paper Award” for the 10th International Congress on Advances in Civil Engineering (Turkey, 2012), and for *The Structural Design of Tall and Special Buildings* journal (United States, 2017). He was Director of the Civil Engineering Department between 2014 and 2018 and was a member of an ACI 318 sub-group for the 2019 version. He is currently the coordinator for the update of the Chilean Design Code for reinforced concrete structures, NCh430.

**Presentation Title: Structuring Shear Wall Buildings Based on Artificial Neural Networks**

In the structural design of shear wall buildings, the initial process requires interaction between the architecture and engineering teams to define the appropriate distribution of walls, a stage typically carried out through a trial-and-error procedure, without any consideration of previous similar projects. For the engineering analysis, the wall thickness and length definition, their location and, in some cases, the presence of new wall sections are required to fulfill not only architectural requirements but also engineering needs such as building deformation limits and base shear, among others. The present investigation consists of two parts to help the structuring of a shear wall building: first, an artificial neural network (ANN) is used for predicting the thickness and length of the wall segments based on information obtained from previous architectural and engineering projects, and second, two convolutional neural network (CNN)
models are used to predict new shear wall not considered by architecture. The study includes surveying the architectural and engineering plans for a total of 165 buildings constructed in Chile. The regression model (ANN) obtained results in terms of $R^2$ of 0.995 and 0.994 for the predicted wall thickness and length, respectively. As a first approach of applying an artificial intelligence model to predict the thickness and length of the walls, remarkable results were achieved; however, the initially proposed purely regressive methodology does not allow the prediction of new elements not present within the architectural plan. The second application is a model that generates a likely image of the final engineering floor plan to propose new structural elements not present in architecture, while reinforcing the existing wall layout. In this contribution, the convolutional layers provide a better extraction of geometrical and topological features. Both models allow building a tool to predict the complete engineering floor plan based on previously validated projects.

2nd Speakers: **Professor Viviana Letelier, PhD, Universidad de La Frontera, and Felipe Vargas, PhD, Universidad Austral de Chile**

Professor Viviana Letelier, PhD, is a Civil Engineer in materials engineering at the Università Politecnica delle Marche, Ancona, Italy. She is a Director and Associate Professor of the Departamento de Ingeniería en Obras Civiles (Civil Engineering Department) at the Universidad de La Frontera, Temuco, Chile. Letelier has focused her research on circular economy and revaluation of construction and industrial residues for use in the construction industry, specifically in cement-related materials, leading 10+ I+D projects and 30+ WOS papers.

Felipe Vargas, PhD, is an Academic of the Instituto de Obras Civiles (Construction Engineering Institute) at Universidad Austral, Valdivia, Chile. Vargas has focused his research on the use of mining residues for use as cement replacement and for manufacturing of artificial aggregates, working in 5+ I+D projects with construction and mining companies and 6+ WOS papers.

Presentation Title: **Improving Performance of Artificial and Recycled Aggregates for a Wider Use in Concrete Mixtures**

The use of recycled and artificial aggregates is considered a suitable alternative for the replacement of natural aggregates in concrete mixtures worldwide. This trend in the use of those alternatives versus natural aggregates has generated changes in several national standards, allowing for use of such aggregates and at higher replacement levels. In the case of recycled aggregates, several researchers have shown that it is possible to improve performance of concrete mixtures at higher replacement levels (over 15 to 20%). One way to improve performance is to remove mortar from recycled aggregates with a thermal treatment. This process generates a higher quality aggregate; nevertheless, the fine fraction of the detached mortar is generally discarded. The use of this fine fraction has been studied, showing that with a thermal shock of 500° it is observed a dehydration process of cement particles. With this process, there is an activation from a cementitious point of view, allowing for higher replacement levels by recycled aggregates without loss of mechanical properties. In the case of artificial aggregates, the use of fly ash and other typical powder residues has been studied in agglomeration processes, including pelletizing and geopolymerization processes as one of the most studied and used technologies to produce pelletized artificial aggregates. In the case of fly ash, powder mixtures with cement up to 10% and the use of a basic solution have shown the feasibility of use of these aggregates for up to 50%. The same technology (pelletizing and geopolymerization) has been used to produce artificial aggregates with copper tailings. Results has shown mechanical properties similar of those of fly ash pellets (15~20 MPa) and impact value results that show the feasibility of use in concrete mixtures. Finally, the feasibility of production of a finer aggregate through geopolymerization has been studied with copper tailings.