

7th JCI-ACI Joint Seminar 2025
Innovations and New Developments in Concrete Structures

Program

July 16th, Wednesday

- 13:00-14:40 Session 1: Organization of codes for seismic performance and existing structures
 14:50-16:50 Session 2: Design advancements for new and existing concrete structures

July 17th, Thursday

- 9:00-10:30 Session 3: Material innovation
 10:45-12:15 Session 4: New developments for sustainable concrete structures
 13:15-14:50 Session 5: Sustainable solutions and future direction for concrete structures

Location

Conference rooms 183-185, 18th Floor, MALIOS, Morioka <https://www.malios.co.jp/english/>

Presentations: 25 min presentation + 5 min discussion

Presentation slide: https://www.jci-net.or.jp/~7th_jci-aci_joint_seminar/

July 16th, Wednesday

13:00-14:40		JCI Moderator – Koichi Kusunoki, The University of Tokyo ACI Moderator – Michael Brown, Wiss Janney & Elstner
Opening address	JCI ACI	Opening address from JCI President, Koichi Maekawa Opening address from ACI President, Maria Juenger
Session 1: Organization of codes for seismic performance and existing structures	ACI JCI ACI	ACI 318/369/562 - Code Meshing: How Does It Work? Andrew W. Taylor, KPFF Consulting Engineers Features of NewRC Design Guidelines Masaomi Teshigawara, Nagoya University Harmonizing Performance-Based Seismic Design - A Comparative Study of US and Japanese Practices for a 10-Story RC Archetype Garrett Hagen, Degenkolb Engineers
10 min break		
14:50-16:50 Session 2: Design advancements for new and existing concrete structures	JCI ACI JCI ACI	JCI Moderator – Hitoshi Shiohara, The University of Tokyo ACI Moderator – Andrew Foden, HNTB Detail of Modeling in the Blind Analysis of NCREE Shaking Test 2018 Yasunori Mizushima, Kobe University Safety of Existing Structures, What Does it Really Mean? Keith Kesner, Simpson Gumpertz & Heger Shear Stiffness Degradation of RC Walls Under Varying Axial Loads Toshikazu Kabeyasawa, Tokyo Metropolitan University Sustainability and Durability Considerations for Design and Preservation of Highway Bridges Michael C. Brown, Wiss, Janney, Elstner Associates

July 17th, Thursday

<p>09:00-10:30 Session 3: Material innovation</p>		<p>JCI Moderator – Shuichi Fujikura, Utsunomiya University ACI Moderator – Matthew Adams, NJIT</p> <p>ACI Recent Advancements in UHPC as a Structural Material Andrew J. Foden, HNTB</p> <p>JCI Repair and strengthening of bridge decks using UHPFRC Tohru Makita, Central Nippon Expressway Company Limited</p> <p>ACI Development of New or Alternate Cementitious Materials Maria Juenger, University of Texas at Austin</p>
<p>15 min break</p>		
<p>10:45-12:15 Session 4: New developments for sustainable concrete structures</p>		<p>JCI Moderator – Hiroshi Mutsuyoshi, Saitama University ACI Moderator – Keith Kesner, Simpson, Gumpertz & Heger</p> <p>JCI Initiatives for the Use of FRP Materials in Non-Metallic Bridges Keijiro Tsurukawa, West Nippon Expressway Company Limited</p> <p>ACI Introducing ACI Code 323 - Low-Carbon Concrete Matthew P. Adams, New Jersey Institute of Technology</p> <p>JCI From Research to Reality: 3D Printing Concrete Developments in Japan Tetsuya Ishida, The University of Tokyo</p>
<p>60 min lunch</p>		
<p>13:15-14:50 Session 5: Sustainable solutions and future direction for concrete structures</p>		<p>JCI Moderator – Tomohiro Miki, Kobe University ACI Moderator – Andrew Taylor, KPFF</p> <p>JCI Quantification of CO2 fixed in cementitious materials: Japanese activities Ippei Maruyama, The University of Tokyo</p> <p>JCI Rehabilitation and Preservation of Extremely Damaged World Heritage Concrete Structures Takafumi Noguchi, The University of Tokyo</p> <p>ACI ACI / JCI Coordination – where do we go from here? Bernard Pekor, American Concrete Institute</p> <p>JCI Closing speech, Tomohiro Miki</p>

**7th JCI-ACI Joint Seminar 2025
Innovations and New Developments in Concrete Structures**

Abstract and speakers' information

July 16th, Wednesday 13:00-14:40

Session 1: Organization of codes for seismic performance and existing structures

JCI Moderator Koichi Kusunoki, The University of Tokyo (kusunoki@g.ecc.u-tokyo.ac.jp)

ACI Moderator Michael Brown, Wiss, Janney, Elstner, Inc. (mbrown@wje.com)

ACI 318/369/562 - Code Meshing: How Does It Work?

Andrew W. Taylor, KPFF Consulting Engineers

Abstract:

The American Concrete Institute publishes and maintains hundred of documents on a wide range of technical topics. Among these are more than 26 codes that set out regulations for the design of concrete structures, and 32 specification that govern concrete construction practices. Among the most frequently referenced ACI design codes are three that regulate the design of new construction (ACI CODE-318), seismic evaluation and retrofit of existing structures (ACI CODE-369), and general condition assessment, repair, and rehabilitation of existing concrete structures (ACI CODE-562). Together, these three codes provide a comprehensive and interwoven set of regulations for the design, evaluation, and rehabilitation of concrete structures.

This presentation describes how the three codes are related to one another, including cross-references, hierarchies of code requirements for different design objectives, and interactions of the codes with other U.S. design standards, such as those that govern structural design loads (ASCE 7), seismic evaluation and strengthening of existing buildings (ASCE 41), and general building code regulations (the International Building Code). Examples are outlined to illustrate how the three codes are applied together, and suggestions are presented for improving coordination between the three codes.

Author bio:

Andrew W. Taylor is a technical director with KPFF Consulting Engineers. Dr. Taylor's technical interests are in four areas: earthquake engineering, structural engineering of reinforced concrete buildings, structural vibrations, and building code development. Dr. Taylor has been actively involved in the work of technical societies for more than 32 years. In particular, he has volunteered extensively with the American Concrete Institute (ACI), and for 17 years has been a member of ACI Committee 318 Building Code Requirements for Structural Concrete and Commentary. In 2019 Dr. Taylor was appointed chair of the ACI 318 Code committee, and remained chair until the revised edition of the Code was published in January 2025. He received his BSCE and MSCE degrees from the University of Washington, and his PhD from the University of Texas at Austin.

Features of NewRC Design Guidelines

Masaomi Teshigawara, Nagoya University, Professor emeritus / Japan Building Disaster Prevention Association, Vice President

Abstract:

In the New RC Project (FY.1988-1992), design guidelines for high-rise RC buildings were established.

The features of these guidelines is that the dynamic design is conducted in two stages; while the seismic motion for design is considered to be one-directional input, it is assumed to be input from all directions. Generally, orthogonal directions X and Y as well as diagonal 45-degree inputs are considered. To ensure safety (safety factor for ultimate state), deformation up to twice the strain energy until the response of extremely large earthquakes can be secured based on the displacement-shear force relationship obtained from static incremental analysis, thereby preventing brittle failure and ensuring deformation capacity. The ratio of building drift angle to maximum inter-story drift angle is set to be 1.5 or less. This concept is reflected in the consideration of safety factor assurance in the Minister's certification review for high-rise buildings design.

Author bio:

Dr. Masaomi Teshigawara is Vice President of Japan Building Disaster Prevention Association (BDPA). His research field is Building Structures, Earthquake-resistant Structures. He is a member of Japan Architectural Institute of Japan, Japan Concrete Engineering Association, Japan Society for Earthquake Engineering. His career is as followings; March 1978 Graduated from the Department of Architecture, Faculty of Engineering, The University of Tokyo. Mar. 1983 Ph.D. in Architecture, Graduate School of Engineering, The University of Tokyo. April 1983 Employed as a researcher at the Housing Construction Laboratory, Building Research Institute, Ministry of Construction. May 1996 Head of Wind Resistance Laboratory. February 1997 Head of Structural Laboratory. Apr. 2001 Senior Researcher, Structural Research Group, Building Research Institute April 2002 Principal Investigator. Apr. 2004 Professor, Department of Urban Environmental Studies, Graduate School of Environmental Studies, Nagoya University. May 2019 Vice Chairman, Building Research Promotion Association. April 2020 Professor, Department of Construction Engineering Chubu University. February 2024 Vice President, Building Disaster Prevention Association. May 2024 Chairman, Council for the Promotion of Advancement of Building Foundations and Geotechnical Technology. He was awarded 1987 Japan Concrete Engineering Society Award, 1996 Architectural Institute of Japan Young Investigator Award, 1996 RM Association Award, 2014 Architecture Award Japan Architectural Institute (paper), 2015 Japan Society of Concrete Engineers Award (Best Paper Award), 2019 Japan Society of Concrete Engineers Award (Best Paper Award), 2023 Minister of Economy, Trade and Industry Commendation.

Harmonizing Performance-Based Seismic Design - A Comparative Study of US and Japanese Practices for a 10-Story RC Archetype

Garrett Hagen, Degenkolb Engineers

Abstract:

As part of the ACI–JCI joint project to compare US and Japanese performance-based seismic design practices, this study builds upon the 2015 E-Defense shaking table experiment, featuring moment frames on one side and concrete shear walls on the other, with necessary modifications to ensure representativeness of each country’s construction practices. The US design adheres to ASCE 7-16 and ACI 318-19 for gravity and seismic load combinations, with performance objectives defined for life safety and collapse prevention limit states based on the referenced standards along with ACI 374.3R-16, LATBSDC-23, and ASCE 41-23. A hybrid analysis approach employs linear response spectrum models in ETABS, complemented by nonlinear dynamic analyses in Perform3D that capture material and geometric hysteresis using fiber-based wall elements and lumped hinge beam/column models. Seismic demands from site-specific MCER and averaged Japanese spectra are compared against deformation-controlled and force-controlled acceptance criteria from ACI 318 Appendix A, ACI 374.3R16, and LATBSDC-23.

Preliminary results highlight systematic differences in drift demands, energy dissipation, and reinforcement detailing driven by divergent code provisions, offering insights for harmonization and demonstrating the robustness of performance-based methods. These findings inform collaborative seismic design strategies aimed at enhancing resilience and efficiency across both codes.

Author bio:

Garrett Hagen is a Principal at Degenkolb Engineers in their Orange County, CA office and is a nationally recognized expert in seismic hazard mitigation. He brings his passion for contributing to state-of-practice standards and guidelines for earthquake resilience to a diverse range of building design and seismic strengthening schemes. In addition to the development of conference papers, committee reports, and the ASCE 41 standard, Garret contributes in the following professional organizational roles:

- Chair of ACI 374 for performance-based seismic design of concrete buildings
- Chair of ACI Committee 369-D for updates to ASCE 41 wall provisions
- Co-chair of SEAOSC Existing Building Committee
- Member of ACI Committees 318H and 440S

July 16th, Wednesday 14:50-16:50

Session 2: Design advancements for new and existing concrete structures

JCI Moderator **Hitoshi Shiohara, University of Tokyo (hshiohara@g.ecc.u-tokyo.ac.jp)**
ACI Moderator **Andrew Foden, HNTB (afoden@hntb.com)**

Detail of Modeling in the Blind Analysis of NCEE Shaking Test 2018

Yasunori Mizushima, Kobe University

Abstract:

The National Center for Research on Earthquake Engineering in Taiwan held an international blind analysis contest for the shaking table test of a half-scale 7-story reinforced concrete building. Our analysis obtained using a detailed finite element (FE) model won the 1st place out of 66 teams. The detailed FE model of the entire building shape was composed of solid elements for concrete parts and beam elements for reinforced bars, and bond slip was defined between the solid and beam elements. The detailed FE model reproduced the structural characteristics of the building with the hidden experimental data in strongly non-linear ranges. However, in smaller deformation ranges, the analysis showed some discrepancies. This inaccuracy can be attributed to the shaking table's rocking motion. To investigate the rocking motion's influence on the results, a numerical optimization was employed to identify it. Even when just the first story's responses were used in the optimization, the FE analysis results for all story drifts got closer to the test results.

Author bio:

- Graduated with a bachelor's degree in engineering from Osaka University in 2006.
- Completed a master's degree at Osaka University in 2008.
- Worked at Takenaka Corporation from 2008 to 2020 (12 years).
 - Engaged in various engineering activities, including Research and development of new construction methods
 - Structural design of spatial structures
- Received a Ph.D. in Engineering from Kobe University in 2016.
- Moved to the University of Hyogo in 2020.
- Since 2023, serving as an Associate Professor at the Department of Architecture, Graduate School of Engineering, Kobe University.
- Research field: applied numerical analysis in structural engineering, covering a wide range of structural types and stages from design to construction.

Safety of Existing Structures, What Does it Really Mean?

Keith Kesner, Simpson Gumpertz & Heger, Inc.

Abstract:

Design professionals are routinely asked to confirm the safety of existing structures. These are increasingly coming in the form of ordinances that require design professionals to identify unsafe conditions and confirm that existing structures are safe for continued use. These ordinances include parking structure and façade inspection ordinances, and milestone inspection ordinances that are triggered based on the age of a structure. Terms like: “safe, secure, and free of defects” (FL Statue.), or “maintained free from deterioration” (2021 IPMC) are included in some of these ordinances. These vague terms may not be achievable and have different meanings to different audiences. To the public and legislators, a phrase like “safe, secure, and free of defects” is typically understood to mean there *will not be* any catastrophic failure, total or partial collapse, or unsafe conditions that could cause harm to occupants or users. Design professionals recognize that categorizing an existing structure as “safe, secure, and free of defects” in absolute terms is either not possible or severely limited by the available knowledge about the structure, the ability to examine the structure, and uncertainty associated with past, current, and future loads. The presentation will discuss the complexities and challenges of condition surveys for qualifying safety that are being required by authorities having jurisdiction to determine if there are readily discoverable indications of deficiencies in existing structural systems.

Author bio:

Keith Kesner, FACI, is a Project Director in the Philadelphia office of Simpson Gumpertz & Heger Inc. He specializes in the evaluation and rehabilitation of existing structures. He is an active member of several ACI Committees including ACI 318, 318-B, 562, 364, and 228. He is a licensed professional engineer in several states and a licensed structural engineer in Hawaii and Illinois.

Shear Stiffness Degradation of RC Walls Under Varying Axial Loads

Toshikazu Kabeyasawa, Tokyo Metropolitan University

Abstract:

In this study, a series of static cyclic loading tests were conducted on serially connected two RC walls to investigate the shear stiffness degradation of the walls under varying axial load. The shear resistance at the tensile-side shear walls decreased down to nearly zero in inelastic range, while the compressive-side wall carried nearly all of the total shear force. A new model, called axial-shear model, was proposed to evaluate the shear stiffness degradation of the central line element including the varying axial load based on the stress-strain constitutive relation of the plane strain element, from which the shear distributions measured in the tests could fairly be simulated.

Author bio:

Dr. Toshikazu Kabeyasawa was a researcher at the Building Research Institute from 2010 to 2016, and an associate professor at Tokyo Metropolitan University from 2016. He specializes in seismic design and tsunami-resistant design of reinforced concrete buildings. He is the secretary of JCI Research and Technology Committee TC244A.

Sustainability and Durability Considerations for Design and Preservation of Highway Bridges

Michael C. Brown, Wiss, Janney, Elstner Associates, Inc.

Abstract:

This presentation will explore aspects of sustainability and durability in the design and preservation of

highway bridges. It will define sustainability in the context of bridge construction, emphasizing the importance of eco-friendly materials, energy-efficient designs, and environmental protection. Key materials will be highlighted for their role in reducing the environmental footprint and enhancing the longevity of bridge structures. Related concepts of durability focus on the selection of robust materials and innovative design techniques that ensure long-term performance and resilience. Examples will demonstrate how state departments of transportation (DOTs) are integrating sustainability into their projects, to achieve both environmental benefits and reliable performance. Challenges such as compatibility of materials and regulatory changes will be addressed, along with strategies to mitigate these complications.

Author bio:

Michael Brown is an Associate Principal with Wiss, Janney, Elstner Associates, who consults on assessment, preservation planning, and rehabilitation of structures for all modes of transportation. Michael specializes in bridge preservation with expertise in reinforced and prestressed concrete structures and corrosion assessment and mitigation. Michael has 13 years of experience as an engineering consultant and 15 years as a research scientist and associate director at the Virginia Department of Transportation. Michael is a national leader in bridge preservation, an ACI Fellow, chair or member of several American Concrete Institute and Transportation Research Board technical committees, and the FHWA Bridge Preservation Expert Task Group, and the Concrete NDE Working Group.

July 17th, Thursday 09:00-10:30

Session 3: Material innovation

JCI Moderator **Shuichi Fujikura, Utsunomiya University (shuichi.fujikura@cc.utsunomiya-u.ac.jp)**

ACI Moderator **Matthew Adams, NJIT (matthew.p.adams@njit.edu)**

Recent Advancements in UHPC as a Structural Material

Andrew J. Foden, HNTB

Abstract:

Ultra-High-Performance Concrete (UHPC) in infrastructure applications presents a compelling option for bridge design, preservation, and repair due to its exceptional durability, corrosion resistance, and high strength properties. This presentation will cover the latest design guidance provided in the recently approved *AASHTO Guide Specifications for Structural Design with Ultra-High-Performance Concrete*. The AASHTO guide specifications define UHPC, present threshold mechanical and durability properties, define material models, and provide design guidance for flexure, shear, and other critical performance metrics. Both prestressed concrete and mild steel reinforced concrete elements are covered in this document. The presentation will also discuss the sustainability of UHPC as a building material and how it can reduce the embodied carbon in civil infrastructure projects considering both the cradle to gate and cradle to grave timeframes. Finally, new applications that take advantage of UHPC's unique properties will be introduced.

Author bio:

Dr. Andrew Foden is a National Bridge Practice Consultant and Vice President with HNTB. Dr. Foden's career focuses on bridge design, technology, high performance materials, and advanced bridge assessment and management systems.

He served as the lead subject matter expert for FHWA on the use of ultra-high-performance concrete as part of their Every-Day Counts rounds 3, 4 and 6. He is a member of numerous professional

industry organizations including the Transportation Research Board, the American Society for Nondestructive Testing, and the American Concrete Institute, where he currently serves as the Chair of the Bridge Design committee. He holds both a BS and PhD from Rutgers University.

Repair and strengthening of bridge decks using UHPFRC

Tohru Makita, Central Nippon Expressway Company Limited (NEXCO Central)

Abstract:

Central Nippon Expressway Company Limited (NEXCO Central) operates approximately 2,000 km of expressways in the central part of Japan, of which approximately 60% have been in service for more than 40 years. Recent years have seen a growing number of damaged and deteriorated bridges in expressways of Japan, and it is anticipated that the number of bridges in such conditions will increase further in the coming decades. To address this issue, an expressway renewal program was launched in 2015. The program encompasses a range of renewal works, including the replacement, repair and strengthening of bridge decks. Regarding the repair and strengthening of bridge decks, the application of a thin layer of UHPFRC on top of bridge decks has been demonstrated to be an effective solution due to its high strength and low permeability. To develop a repair and strengthening method for bridge decks using UHPFRC, Kajima Corporation and NEXCO Central started a joint research project in 2016. This presentation outlines the series of experimental tests that were conducted within the framework of the joint research project. The experimental tests include direct tension tests, interfacial bond strength evaluation between UHPFRC and concrete, restrained shrinkage tests and moving wheel load tests. In addition, a brief overview is provided on the Okaya viaduct repair project, which involves the in-situ cast of 40 mm-thick UHPFRC on the deck employing a recently developed UHPFRC overlay construction process.

Author bio:

Dr. Tohru Makita is a Bridge Engineering Expert at NEXCO Central. He has been involved in numerous bridge construction projects, as well as research and development projects related to bridges. He is a member of multiple professional organizations, including the Japan Concrete Institute, the American Concrete Institute, and the International Federation for Structural Concrete (fib).

Development of New or Alternate Cementitious Materials

Maria Juenger, University of Texas at Austin

Abstract:

There is global interest in the partial or complete replacement of portland cement in concrete to reduce carbon emissions associated with concrete production. The interest in alternative cements and supplementary cementitious materials is growing in the United States, with both well-established and start-up companies producing new materials. This presentation will cover some recent developments and challenges in this space, summarizing a few promising new materials and discussing laboratory research results with selected materials.

Author bio:

Dr. Maria Juenger is a Professor and Ernest Cockrell, Jr. Centennial Chair in Engineering #2 in the Fariborz Maseeh Department of Civil, Architectural, and Environmental Engineering at the University of Texas at Austin. Dr. Juenger's teaching and research focus on materials used in civil engineering applications. She primarily examines chemical issues in cement-based materials, including phase formation in cement clinkering, hydration chemistry of cements and supplementary cementitious materials, and chemical deterioration processes in concrete. Her current research efforts emphasize

the interaction of cement-based materials and the environment. This work encompasses the development and characterization of cementitious systems with lower carbon dioxide and energy footprints, as well as the capacity of cementitious materials to produce or remove airborne and waterborne pollutants. Dr. Juenger is a fellow of the American Concrete Institute (ACI) and the American Ceramic Society (ACerS) and currently serves as President of ACI. She has received several awards from ACI for her research, teaching, and service, including the Walter P. Moore, Jr. Faculty Achievement Award, the Young Member Award for Professional Achievement, the Wason Medal for Materials Research, the Delmar L. Bloem Distinguished Service Award, and the Concrete Sustainability Award. She also received a Faculty Early CAREER Award from the National Science Foundation. She is on the editorial boards of both Cement and Concrete Research and Cement and Concrete Composites. Dr. Juenger received her B.S. degree in Chemistry and Spanish from Duke University and Ph.D. in Materials Science and Engineering from Northwestern University. After completing her Ph.D., she was a postdoctoral researcher in Civil Engineering at the University at California, Berkeley before coming to the University of Texas at Austin.

July 17th, Thursday 10:50-12:15

Session 4: New developments for sustainable concrete structures

JCI Moderator **Hiroshi Mutsuyoshi, Saitama University (mutuyosi@mail.saitama-u.ac.jp)**

ACI Moderator **Keith Kesner, Simpson, Gumpertz & Heger, Inc. (kkesner3006@gmail.com)**

Initiatives for the Use of FRP Materials in Non-Metallic Bridges

Keijiro Tsurukawa, West Nippon Expressway Company Limited (NEXCO West)

Abstract:

In Japan, the number of expressways that were built over 50 years ago has increased, and the deterioration and damage of structures have become more pronounced, making the maintenance of existing structures a challenge. Particularly in concrete structures, the use of anti-freezing agents in winter and salt exposure from sea water spray have resulted in corrosion of steel materials and deterioration and spalling of reinforced concrete. Although repairs are carried out as necessary, maintenance costs continue to rise. Therefore, for newly constructed structures, it is desirable to democratize more durable reinforced concrete structures, as the deterioration of reinforced concrete structures due to salt damage is severe.

To eliminate the risk of damage to concrete structures caused by the corrosion of PC Strand (Prestressed Steel Strand) and rebars, we have developed and implemented an ultra-durable bridge that does not use steel materials. On an expressway in the Shikoku region, the Bessodani Bridge, a non-metallic PC box girder bridge, was constructed in 2020. Aramid FRP (Fiber Reinforced Polymer) was used in the superstructure box girder instead of PC steel strands, and Glass FRP was used in the balustrade instead of steel rebars. Prior to the adoption of these FRP materials in practice, experiments were conducted, and it was confirmed that there were no problems in their implementation. In this presentation, the background of this study, features of the adoption of FRP materials in the Bessodani Bridge, and the future prospects of FRP materials will be presented.

Author bio:

Keijiro Tsurukawa joined West Nippon Expressway Company Limited in 2017 and has been involved in expressway maintenance and management projects in the Kyushu and Chugoku regions. During this time, he was involved in bridge repair work to improve the integrity of deteriorated concrete structures by implementing countermeasures against spalling.

He later studied at the University of California San Diego through the company's study abroad

program and obtained a master's degree in structural engineering. In addition, while working as a trainee at NEXCO West-USA, he gained experience with non-destructive inspection techniques, including infrared inspection.

After returning to Japan and gaining experience in the General Management Section, he is currently part of the Bridge and Structural Engineering Division of the Shikoku Branch. In his current role, he is primarily engaged in the design and construction management of new bridge installations for four-lane expressway projects within Shikoku.

Introducing ACI Code 323 - Low-Carbon Concrete

Matthew P. Adams, New Jersey Institute of Technology

Abstract:

The American Concrete Institute recently published CODE 323: Low-Carbon Concrete, a first-of-its-kind model building code that covers provisions for setting carbon emissions requirements associated with cast-in-place concrete. The Code takes a carbon budget approach to reducing the carbon emissions associated with concrete construction, allowing flexibility in mixture proportioning choice by engineers. During this presentation, the new Code will be introduced along with example calculations. A review of the scope and applicability of Code 323, and how it may be adopted will also be presented. A discussion of the impetus for development of the Code, comparison of the Code to existing policies and provisions, worldwide, for low-carbon construction materials will also be provided.

Author bio:

Dr. Matthew Adams is an associate professor and co-director of the Materials and Structures (MatSlab) at the New Jersey Institute of Technology in Newark, NJ. His research focuses on the sustainability, resiliency, and long-term durability of innovative cement-based materials. He also studies how governmental policies both support and hinder the adoption of sustainable practices in construction. He is a fellow of the American Concrete Institute, where he is currently chairman of the ACI 323 Low Carbon Concrete Code Committee; he is also a member of ASTM, where he chairs the Subcommittee on Testing for Strength of Concrete.

From Research to Reality: 3D Printing Concrete Developments in Japan

Tetsuya Ishida, The University of Tokyo

Abstract:

This presentation highlights recent advancements in 3D concrete printing (3DP) in Japan, with a particular focus on its rapid transition from research to practical implementation. Since around 2022, the number of construction sites adopting 3DP has grown rapidly, projected to reach approximately 150 projects annually by 2024. This acceleration is largely driven by a serious shortage of skilled labor, particularly formwork carpenters, due to Japan's aging construction workforce.

One promising solution is the use of 3D printed permanent formworks for reinforced concrete structures. These formworks—often produced with high-strength, fiber-reinforced mortar—offer significant improvements in ductility and durability through enhanced crack distribution and confinement. Experimental studies on reinforced concrete columns using 3D printed formworks have shown outstanding structural performance, which has been validated through FEM-based simulations developed at the University of Tokyo. These columns are modeled as composite members composed of printed layers and core concrete, demonstrating the feasibility of practical applications.

Japan's seismically active environment further underscores the need for highly resilient structural systems, where 3DP offers a viable approach. Applications now span from pedestrian and road bridges to roadside retaining walls. In parallel with this growing adoption, the Japan Society of Civil Engineers has developed comprehensive guidelines for the design and construction of 3D printed permanent

formworks. These guidelines were approved for publication in March 2025 and are currently in preparation for printing. The presentation will also introduce the structure and content of these forthcoming guidelines, which are expected to play a key role in standardizing and expanding 3DP technology in civil infrastructure.

Author bio:

Tetsuya Ishida is a Professor in the Department of Civil Engineering and Vice Dean of the Graduate School of Engineering at the University of Tokyo. He received his PhD in 1999 and conducted postdoctoral research at the University of Toronto. Since 2023, he has also served as Director of the Academic Strategy Office and the Office for the Promotion of Industry-Academia Collaboration. Prof. Ishida's research focuses on the lifecycle performance of concrete structures. He has developed a unified, multiscale, multiphysics simulation platform that integrates over 20 governing equations and 500 variables, enabling predictive modeling from early-age behavior to long-term deterioration. His approach eliminates reliance on empirical formulas and is recognized for its scientific rigor and practical relevance. A key focus of his recent work is the development and field implementation of 3D concrete printing (3DCP). He chaired the Technical Committee on 3D Printing Technology at JCI (2019–2021) and currently leads the 3DP Subcommittee of the Japan Society of Civil Engineers, contributing to national design and construction guidelines. His laboratory collaborates with major construction companies and public agencies to test and deploy 3DP technologies in real structures such as bridges and retaining walls. Prof. Ishida is a principal investigator in the "Cross-ministerial Strategic Innovation Promotion Program (SIP)," funded by the Cabinet Office of Japan. His contributions to SIP Phase 3—titled "Smart Infrastructure Management System"—support the integration of digital construction technologies, such as 3DCP, to accelerate social implementation and infrastructure resilience. He has received awards from JSCE, JCI, fib, and IABSE, including the inaugural fib Achievement Award for Young Engineers and the IABSE Prize. His research also supports national goals in circular economy and carbon-neutral construction.

July 17th, Thursday 13:15-15:00

Session 5: Sustainable solutions and future direction for concrete structures

JCI Moderator Tomohiro Miki, Kobe University (mikitomo@port.kobe-u.ac.jp)

ACI Moderator Andrew Taylor, KPFF (andy.taylor@kpff.com)

Quantification of CO₂ fixed in cementitious materials: Japanese activities

Ippei Maruyama, The University of Tokyo

Abstract:

For the carbon neutrality of the concrete sectors, many mitigation strategies are investigated and developed. Currently, many activities include carbon capture, storage, and utilization methods using cementitious materials, while a quantification method for CO₂ fixed in the cementitious materials has not been established. In this contribution, scientific and in-field experiences that contribute to the standardization of CO₂ quantification will be shown and discussed.

Author bio:

Dr. Ippei Maruyama is a professor at the University of Tokyo. He is a visiting professor of the Museum at Nagoya University and of the Research Center for Green X-tech at Tohoku University. He is the chair of the International Committee on Irradiated Concrete, the editor-in-chief of the Journal of Advanced Concrete Technology, and an associate editor of Materials and Structures. He is leading several national projects relating to the aging management of concrete structures in nuclear power plants, the

Fukushima Daiichi decommissioning process, and the standardization of quantification methods for mineralized CO₂ using cementitious materials.

His current research topics include atomic-scale studies of the colloidal nature of C-S-H, design of concrete structures, radiation physics and chemistry for concrete, multi-scale modeling of concrete and concrete structures, and application of calcite concretion.

Rehabilitation and Preservation of Extremely Damaged World Heritage Concrete Structures

Takafumi Noguchi, The University of Tokyo

Abstract:

Hashima Island once flourished as an undersea coal mine and was an important island that supported Japan's modernization, and was inscribed on UNESCO's World Heritage List in 2015. A number of reinforced concrete buildings on the island are over 100 years old, and more than 50 years have passed since they were no longer maintained. However, due to the harsh saline environment, some of the buildings are close to spontaneous collapse due to severe corrosion of the reinforcing steel bars. In this presentation, the followings are reported. The condition of the concrete in the remaining reinforced concrete buildings on Hashima Island was investigated, and the deterioration levels of all members were visually evaluated and classified. Based on the results of the evaluation of deterioration levels, the remaining vertical load-bearing capacity and the remaining seismic capacity of each member were calculated based on the experience in determining the degree of damage caused by earthquakes. Furthermore, the progression of future deterioration was estimated, and the remaining life expectancy of each building was calculated. In addition, using one building as an example, repair and rehabilitation methods for preserving historical buildings with cultural asset value that have deteriorated excessively were discussed. At the end of the presentation, the value of the remaining reinforced concrete buildings on Hashima Island is discussed and ways to preserve them are proposed.

Author bio:

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JCI / ACI Coordination – Where do we go from here?

Bernard Pekor, American Concrete Institute

Abstract:

ACI and JCI have a long history of working to advance concrete knowledge. Since 2012, ACI and JCI have completed numerous "Joint Seminars" to exchange knowledge and develop a stronger relationship. This presentation will take a brief look at the history and achievements of the ACI/JCI Joint Seminars, as well as the constraints and problems that could jeopardize future events. Some ideas for possible

future joint projects for members of ACI and JCI will be suggested, leading to a group discussion of “Where do we go from here?”

Author bio:

Bernie Pekor serves as the Director, International Affairs, for the American Concrete Institute (ACI), and is responsible for business development and relationship building with industry organizations associated with the international efforts of ACI. Mr. Pekor works with international organizations to develop strategic plans relating to the globalization of ACI’s knowledge products and services, as ACI strives to achieve the vision of “a future where our stakeholders have the knowledge and skills necessary to use concrete effectively in a changing world.” Accordingly, he coordinates the strategic development and implementation of plans for key development regions, including Asia, the Middle East, Latin America, China, India, Australia, and beyond. Mr. Pekor has over 30 years of experience in international sales, marketing, and business development.

Mr. Pekor has over 30 years of experience in international sales, marketing and business development, having served as the Director of International New Markets & Asia, Detroit Regional Economic Partnership (Detroit Regional Chamber). There, he cultivated business relationships and developed strategies for increasing engagement throughout Asia, Europe, Latin America, Middle East, Africa and Australia/New Zealand. He established and developed relationships with key companies in focus countries, including China, India, Japan, and Korea, encouraging their overseas expansion to Michigan. Prior to working for the Chamber, he served as the International Sales and Marketing Manager for The Stroh Brewery Company.