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3rd INTERNATIONAL SUMMIT ON

CIVIL, STRUCTURAL AND ENVIRONMENTAL ENGINEERING

Civil

Structural

Environmental Engineering

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FOREWORD

Dear Colleagues,

It is our pleasure to extend a warm invitation to all scientists, academicians, young researchers, business delegates, and students from around the globe to participate in the **3rd International Summit on Civil, Structural and Environmental Engineering (ISCSEE2025)**, scheduled to take place in **Frankfurt, Germany** from **July 21-22, 2025**.

ISCSEE2025 will provide a platform to explore recent research and cutting-edge technologies, attracting a diverse and enthusiastic audience of young and talented researchers, business delegates, and student communities.

The primary objective of **ISCSEE2025**, a gathering of scientists and engineers from across the globe to share and exchange groundbreaking ideas in the fields of Civil, Structural and Environmental Engineering. The summit aims to foster high-quality research and international collaboration, facilitating discussions and presentations that are globally competitive and highlighting recent notable achievements in these fields.

We're looking forward to an excellent meeting with scientists from different countries around the world and sharing new and exciting results in Civil, Structural and Environmental Engineering.

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Solid Waste-Based Low Carbon Cementing Materials

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Abstract

The utilization of solid waste resources and low-carbon cementing materials are important paths for building materials industry to achieve the goal of "double carbon". The report systematically introduced the research contents and achievements of the low-carbon and long-life building materials research team in the collaborative use of various solid wastes to prepare low-carbon cementing materials, including the mixture design of low-carbon cementing materials, mechanical properties under disaster environment, material durability, microstructure, structural component behavior and low-carbon technology and evaluation. The low carbon path of preparation geopolymer concrete by utilizing solid wastes such as fly ash, slag and red mud was proposed. Aiming at the problems of low efficiency of mixture design, deterioration of material properties, and balanced development of environmental benefits and engineering performance, the main research achievements of the team in four aspects: material accurate design, performance optimization, performance under disaster environment and multi-objective comprehensive evaluation system were presented. Finally, suggestions and prospects for the future development of low-carbon cementing materials were put forward.

Keywords: low carbon, solid wastes, geopolymer, evaluation system.

Biography

Wang Qingyuan, Ph.D. (France), Professor of Sichuan University, doctoral supervisor, Director of Provincial Key Laboratory, former President of Chengdu University, Member of the European Academy of Sciences, member of the European Academy of Sciences and Arts, valid academician candidate of the Chinese Academy of Engineering, member of the National Jieqing, member of the seventh Review Group of Mechanics Subject of the Academic Degrees Committee of The State Council, editor-in-chief of the international journal Green Buildings and Materials. He is mainly engaged in the research of new materials and structural mechanics, low-carbon and long-life building materials, solid waste resource recycling and low-carbon sustainable development, etc. Constr Build Mater, J Cleaner Production, Cement & Concrete Comp, J Hazard Mater, Adv Mater, Prog Mater Sci, He has published more than 100 papers in the Top journals of the 1st region of the Chinese Academy of Sciences, such as Nature Commun and Nature, and has been selected as the most cited scholars in China by Elsevier for ten consecutive years, as well as the annual and career list of the world's 2% top scientists. More than 50 invention patents have been authorized, and 5 academic monographs have been published. As the first completed person, he won the second prize of National Natural Science, the first prize of Natural Science of the Ministry of Education, the first prize of Science and Technology Progress of Sichuan Province, and the first prize of Science and Technology Progress of Chinese Mechanics Society.

Pathway for Commericalisation on Recycled Concrete

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Abstract

The pathway to commercialization of recycled concrete involves transforming waste concrete into valuable building materials through a systematic process. It begins with research and development (R&D) to assess the feasibility and performance of recycled aggregates. Next, efficient methods for crushing, sorting, and processing are developed to ensure quality standards are met. Intellectual property protection, such as patents, may be sought for innovative recycling technologies. Scaling production involves securing funding, establishing supply chains, and addressing regulatory approvals. Marketing strategies target environmentally-conscious construction sectors, while partnerships with builders and developers facilitate market adoption. Continuous feedback and adaptation are essential for long-term success.

Air-Water Interface Adsorption Impacton PFAS Transport Through Vadose Zones

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Abstract

Per-andpoly fluoro alkyl substances(PFAS)are a group of chemical compounds that exhibit diverse physicochemical properties, making them useful in a variety of industries and products, which has contributed to their widespread presence. PFAS are known for their ability to partition, bio accumulate, and bio transform, and their strong carbon-fluorine bonds make them resistant to degradation. PFAS have been used in various products over the years, leading to their accumulate on in the environment. Due to their presence in the environment and toxic effects on humans and wildlife, they have raised significant concerns about their environmental fate and impact. PFAS have thus garnered considerable attention due to the risks they pose to human health, the ecosystem, and groundwater. Despite extensive research, especially on Per fluoro octanoic acid (PFOA) and Per fluoro octane Sulfonic acid (PFOS), many questions remain about the behavior and movement of PFAS in unsaturated zones and their impact on groundwater.

This work investigates the fate and transport of PFAS, specifically PFOS, in both saturated and unsaturated zones through numerical modeling using the finite-difference method. The study examines the impact of transport processes, such as advection, diffusion, and adsorption, on the behavior of PFAS in soil and groundwater. Following the development of the model, a sensitivity analysis was conducted to evaluate the model's sensitivity to spatial and temporal discretization. The results indicated minimal sensitivity. Multiple scenarios were then simulated using the model to qualitatively verify the results and understand the fate and transport of PFAS in both vadose and saturated zones.

Biography

Dr. Arvin Farid is a Professor of the Civil Engineering Department and the Director of the SEnS-GPS Program, sponsored by the U.S. National Science Foundation, at Boise State University. He is the chair of the Geoenvironmental Engineering Technical Committee of the American Society of Civil Engineers (ASCE) Geo-Institute (GI) and an advising editor of the Environmental Geotechnics Journal. He also serves on several national and international committees. He received his Ph.D. from Northeastern University, Boston, MA, and his M.Sc. and B.Sc. degrees from Shiraz University, Shiraz, Iran.

He has pioneered the leading edge of research on the use of electromagnetic(EM) fields for geoenvironmental/geotechnical applications. His research includes EM-induced remediation, EM waves' effect on soil properties, energy geo-storage, material characterization, power infrastructure vulnerability, and liquefaction mitigation. His most recent research focuses on wildfires' impacts, resilience against them, and restoration and remediation post-fire

and PFAS fate & transport, detection, and removal. Dr. Farid has been awarded several honors and awards from different organizations for his publications and contributions and research grants from the

U.S. National Science Foundation (NSF) and National Aeronautics and Space Administration (NASA) among others. He has published in several prestigious journals and presented at numerous international conferences in civil engineering, electrical engineering, and geophysics.

Geotechnical Innovations for Design and Construction of a Freeway in Australia

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Abstract

The designers and the contractors have often faced many different geotechnical challenges in the design and the construction of the freeways built on the problematic grounds, such as the soft grounds, the historic land fill sites, the wetlands, the marine tidal flat or the deltaic, low-lying flood plain. Many freeways have been built to flyover the railway corridor sort crossover the river sort hills. Some of the freeway shave been upgraded to heighten and widen the existing freeways etc. More demand shave arisen to achieve low risk, cost effective and sustainable outcomes in terms of the design and the construction. At the same time, the relevant authorities have amended the industry standards over they ears to tight up the design requirements more and more rigorously. The contradictions between the demands to achieve cost effective and sustainable outcomes and the more stringent industry standards have been getting worse over the years particularly in Victoria, Australia. This demands more geotechnical innovations and better cooperations a cross the multiple disciplines and between the designers and the contractors in every phase of the design and the construction. This paper will present some key experiences and lessons learned from the recent completed Mordialloc Freeway project in Melbourne, Australia where geotechnical innovations have played significant roles in its final success.

The paper will commence with a discussion of the relevant design requirements in Victoria, Australia and of the differences of the key design requirements in one or two other states. The paper will then move to introduce the Mordialloc Freeway project as a case study; to present the geological conditions of the project alignment; and to discuss the engineering challenges with the focuses on geotechnical challenges; subsequently will discuss and present the key engineering innovations, the key design outcomes, and the key performance review results; and finally, will conclude this paper with some technical insights and recommendations for future design and construction of the similar projects.

The complexities and challenges of the Mordialloc Freeway project demanded that the designers continually sought to challenge convention in developing many innovative design and practical solutions. The innovations also enabled significant high proportion of recycled materials to be used during construction which created sustainable, positive impacts for our community. The cumulative / multiple cost-effective, innovative, yet low risk constructable geotechnical solutions provided by the design erson the Mordialloc Freeway project were made possible through a collaborative approach by all involved particularly the support from the client, and from the project owner. The innovations displayed throughout the Mordialloc Freeway project set a great new benchmark of the values that can be provided to future road projects and similar relevant infrastructure projects.

The Use of Piles to Enhance Energy Efficiency in Smart Cities

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Abstract

The rapid urbanization and population growth in urban areas present significant challenges to energy efficiency, particularly in heating and cooling systems within buildings. As the global urban population continues to grow, cities face immense pressure to adopt innovative and sustainable energy management strategies. This paper examines the utilization of pile foundations as a cutting-edge solution to enhance energy efficiency, focusing on their ability to integrate heat exchange systems and optimize energy use in urban infrastructure.

Pile foundations, traditionally used for structural stability, offer untapped potential for thermal energy management. By leveraging the thermal properties of these foundational systems, cities can significantly reduce their reliance on conventional energy-intensive methods for heating and cooling. This paper explores the dual functionality of pile foundations: supporting structural loads and serving as energy-efficient systems to address urban energy demands.

The study conducts a comprehensive review of various pile types, including concrete, steel, and timber piles, assessing their potential for energy optimization. Special emphasis is placed on innovative designs, such as geothermal heat exchangers embedded in pile systems. These technologies allow for the sustainable transfer of heat between buildings and the surrounding soil, reducing greenhouse gas emissions and promoting environmental sustainability.

Case studies from diverse global contexts are presented to illustrate the practical applications of energy-efficient piles. For example, a mixed-use development in Turin, Italy, successfully integrated pile foundations with geothermal systems, achieving a 25% reduction in energy consumption. Similarly, a mosque in Yemen utilized lightweight, recycled materials in conjunction with thermally optimized piles, resulting in significant energy savings in a challenging climatic environment. These examples underscore the versatility and effectiveness of pile-based systems in varying geographic and climatic conditions.

The findings of this paper highlight the role of pile foundations in smart city planning, where sustainable urban development is prioritized. By incorporating pile-based energy solutions, cities can achieve greater energy efficiency, reduce operational costs, and enhance resilience to environmental challenges. This approach aligns with global sustainability goals, offering a viable pathway to reduce carbon footprints and improve urban living standards.

This research provides critical insights for engineers, urban planners, and policymakers seeking innovative solutions to urban energy challenges. It bridges the gap between theoretical engineering advancements and practical applications, ensuring that cities can adapt to future energy demands while maintaining ecological balance. Fu-

rthermore, the integration of pile foundations into smart city frameworks demonstrates the potential for interdisciplinary collaboration in achieving sustainable urban development.

In conclusion, pile foundations represent a promising avenue for addressing the energy challenges of modern urbanization. By transforming traditional infrastructure into energy-efficient systems, cities can not only meet current energy demands but also pave the way for a more sustainable and resilient urban future. This study calls for further research, design and collaboration to unlock the full potential of pile-based systems in smart city development.

Keywords: Smart Cities, Piles, Energy Efficiency, Innovation.

Biography

Esraa Daoud is chartered geotechnical engineer and PhD student having over 17 years' experience in geotechnical engineering and design across Middle East. My experience covers the engineering aspects starts from scoping of work, ground specification and site supervision of ground investigation, ground improvement and pile testing, geotechnical interpretation and determination of geotechnical design parameters, design management of causeways foundations, roads, retaining walls and geotechnical design of major structures such as commercial, retail, high-rise building, rail and highways projects, design of shallow and deep foundations, enabling works and piling contracts for various construction schemes in United Arab Emirates, Bahrain, KSA, UK and Qatar.

Esraa is acting as geotechnical design lead, leading the design team from technical and commercial perspective in growing a profitable and viable Geotechnical Engineering business and to work collaboratively with both internal and external clients including various government departments, contractors and others across Middle East. My experience includes design and management of geotechnical inputs from small to large, complex multidisciplinary projects. This involves coordinating people, facilities and resources within agreed timelines and in accordance with budgetary constraints.

Evaluation of Groundwater Quality Using GIS and Water Quality Indices and the Use of Phytosanitary Products in the Feija Plain, South-East Morocco

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Abstract

This study examines groundwater quality in the Feija alluvial plain, southeastern Morocco, shedding light on the impacts of agricultural overexploitation and climate change. Employing the Water Quality Index (WQI) and Geospatial Analysis (GIS), it evaluates the suitability of water for domestic and agricultural uses through seasonal analysis of samples. The data reveal a wide variation in water quality, with some regions having average to poor M'nasra aquifer and the Tinzouline aquifer (Draa, Morocco). Some research is being carried out Tinzouline and M'nasera aquifers. The Feija aquifer boasts a heterogeneous composition, comprising Plio-Quaternary terrains of varying thickness. The analysis identifies diverse chemical facies of groundwater, encompassing calcium bicarbonate, sodium chloride, and chloride sulfate, calcium, and magnesium. These characteristics mirror the influence of both human activities and natural conditions on water quality. The spatial distribution of the WQI predominantly indicates good water quality, albeit with variations attributed to agricultural practices and the unique geology of the region, particularly noticeable at sites P5 and P6 where quality is diminished. In terms of agricultural use, quality indices suggest marginal water suitability, with concerns revolving around salinity and sodium, necessitating vigilant management to uphold agricultural sustainability. Lastly, the study unveils an absence of significant nitrate pollution, with groundwater maintaining cleanliness. These findings underscore the significance of monitoring and managing water resources to tackle current and future challenges posed by agriculture and climate change in the region.

Keywords: groundwater quality, WQI, irrigation uses, Feija plain.

Experimental and Finite Element Evaluations of Reinforced Cementless Fiber Composite Walls

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Abstract

To replace concrete which had some disadvantages in emissions of carbon occurring in the manufacture process of cement, cementless Alkali-activated slag was developed as one of cementless concrete. By mixing synthetic short fibers within cementless binders, cementless fiber composite was newly manufactured in order to improve brittle characteristics of the slag binder and tested its material and mechanical characteristics from several experiments such as slump flow, compressive, and direct tensile tests. The cementless fiber slag showed highly flowable in the fresh state soon after finishing of mixing, and in the hardened state could develop ductile tensile behaviors exceeding 2.0~5.0% in tensile strains and could lead multiple micro-cracks by restraining local crack widths. The cementless fiber slag was applied to structural walls considering the amount of transverse and longitudinal reinforcing steel bars as design variables, and in-plane loading tests on wall specimens were carried out and the experimental and three-dimensional finite element results were compared with conventional reinforced concrete walls. Two cases for applications of reinforcing steel bars in transverse and longitudinal directions of walls were considered as standard design strength requirements and minimum reinforcement requirements.

It was manifested from experimental results and finite element predictions that reinforced cementless fiber composite walls showed excellent performances in improvements of overall in-plane load-carrying capacities of the walls as well as lateral stiffnesses of the walls. Moreover, reinforced cementless fiber composite walls exhibited enhancements in crack controls in mitigating damages caused by local expansions of crack widths which were well observed in conventional reinforced concrete walls. To compare with the conventional reinforced concrete wall, reinforced cementless fiber composite wall had environmentally friendly advantages as it could reduce carbon emissions during the manufacture process, and had high ductile tensile performances, so that reinforcing steel bars could be minimized both in transverse and longitudinal directions of the wall.

Keywords: Cementless concrete; Fiber composite; structural walls; reinforced concrete.

Acknowledgement: This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (No. 2023R1A2C2003175).

Biography

Dr. Chang-Geun Cho was born in Daegu, Republic of Korea on January 16, 1970. Professor Cho received Ph.D in Tokyo Institute of Technology is teaching in the field of concrete structures in department of architectural engineering, Chosun University, and president in Korean Association for Spatial Structures as well as Research Board (RB) in National Research Foundation of Korea. Dr. Hyeon-Ku Park is working as professor in Songwon University, Republic of Korea, in the field of building environments with controls of building sounds and vibrations. Msc. Sang-Kyoo Park, as President and CEO in EQ Structural Engineering Co. in Republic of Korea, is running several companies specializing in steel and concrete composite structures.

Molecular Mechanisms Underlying the Regulation of Recipient and Plasmid-Mediated ARGs Transformation by Iron Nanoparticles

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Abstract

Bacterial infection is one of the most important causes of death in humans, and the emergence of antibiotic resistance genes (ARGs) may further increase the risk of clinical disease. Soil is an important environmental reservoir, natural source, and transmission center of ARGs. Transformation is one of the main pathways for horizontal transfer of ARGs in soil environments. Nano-sized iron minerals, which are critical components of soil and are widely used in soil remediation, can influence the transformation of antibiotic resistance genes (ARGs) by regulating recipient bacteria and free DNA (plasmids). However, their underlying molecular mechanisms remain unclear. This study investigated the effects of nano-sized goethite, hematite, and ferrihydrite at concentrations relevant to natural and remediation scenario on ARGs transformation efficiency and frequency. Transcriptome sequencing was employed to elucidate the molecular mechanisms. Results revealed that low concentrations of nano-sized iron minerals enhanced ARGs transformation. This promotion was attributed to increase proportions of supercoiled plasmids and plasmid aggregation, facilitating ARGs transfer. Additionally, these minerals directly altered cell membrane integrity, elevated intracellular ROS levels, and upregulated genes associated with membrane permeability, thereby increasing pore formation and enhancing plasmid uptake efficiency. Furthermore, nano-sized iron minerals upregulated genes linked to transformation processes, indirectly boosting ARGs transformation. In contrast, high concentrations of nano-sized iron minerals reduced bacterial responsiveness and effective plasmid-bacteria contact due to mineral aggregation and coating formation. This study provides critical insights into the role of nano-sized iron minerals in ARGs transformation under natural and remediation scenarios, unravels their molecular mechanisms, and offers a foundation for mitigating ARG-related risks in soil environments.

Keywords: Antibiotic resistance genes, Iron oxides, Transformation, Reactive oxygen species.

Finite Element Modelling of Wood-Sheathed Cold-Formed Steel Shear Walls

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Abstract

Cold-Formed Steel Shear Wall Panel (CFS-SWP) have been extensively used in lightweight steel construction. Although effective design recommendations for lightweight steel members and structures are available, due to the specific characteristics of thin-walled sections and their assembly features, the introduction of openings regarding architectural aspects is still attracting designers and researchers' attention.

In this context, the present paper put forward a sufficiently detailed modelling technique using Abaqus software, capable of simulating with reasonable precision the effect of the opening on the shear wall panel behaviour under a lateral load. Hence, a special emphasis is placed on the modelling technique of the screw connection, which govern the global response of the shear wall panel. An adequate force-displacement envelope curve of the screw that integrates the material nonlinearity has been introduced. The nonlinear mechanical properties for cold-formed steel members, the orthotropic characteristics of the wood structural sheathing, and geometrical imperfection have also been taken into account. Hence, the Finite Element (FE) modelling has been validated using existing experimental data. Based on this approach, it turns out that the introduction of the opening leads to reducing the resistance of the SWPs by 45%. In addition, a parametric study is also conducted in order to evaluate the shear resistance of SWPs with different spacings of assembly screws.

Keywords: Shear wall panel, Wood structural sheathing, Finite Element modelling, screw connection.

Biography

Dr. Idriss Rouaz is a senior researcher and head of the steel structure research team at the National Centre of Studies and Researches Integrated in Buildings in Algeria. He has authored and co-authored numerous scientific articles published in specialized journals and presented at international conferences. Additionally, he serves as a committee member responsible for issuing "Technical Approvals" for innovative construction products introduced to the Algerian market.

Numerical Analysis of a Water Tank Built on Clayey Soil Reinforced with Stone Columns

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Abstract

To guarantee structural integrity, safety, and effective water storage, a number of features are taken into account while designing a storage tank. The foundation settlements are considered to be one of the critical features of their design. In the case of excessive settlements, stone columns are usually used to reduce the rate of settlements. In the present study, using the numerical finite element program PLAXIS 3D, the contribution of stone columns in the reduction of total settlements is studied in the case of a circular metallic tank that is 36.1 meters high and 9 meters in diameter, supported by a circular raft foundation resting on clayey soil. The results showed that the use of 25 stone columns of 10m length arranged in a staggered pattern reduced the total settlements by 30%.

Keywords: Water-storage tank, Numerical analysis, Stone columns.

Biography

Dr. Sid Ali Rafa is a senior researcher and head of the geotechnical hazard research team at the National Centre of Studies and Researches Integrated in Buildings in Algeria. He is author and co-author of several scientific articles that were published in specialized journal and presented in many international conferences. He is a member of the committee in charge of the revision of the “Algerian seismic code”, member of the committee in charge of the redaction of the “Algerian guide for the design and construction of foundations in arid zone” and member of the committee in charge of delivering “Technical Approvals” for new construction systems that are newly used in Algeria.

Residual Flexural-Tensile Strength of Steel Fibers Reinforced Concrete with Different Number of Hook-ends

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Abstract

Fiber-reinforced concrete (FRC) enhances ductility and controls crack propagation in structural elements. Although its structural use is not yet fully codified in major design standards, both Europe and the United States provide testing protocols and partial design guidance for Steel Fiber-Reinforced Concrete (SFRC). In Europe, EN 14889-1 specifies steel fiber properties, while EN 14651 outlines procedures for determining residual flexural tensile strength. Although Eurocode 2 does not yet fully incorporate SFRC, various national annexes and technical documents, particularly in countries like Austria, Italy, and Switzerland permit the use of reinforcing fibers in applications such as tunnel linings, slabs, and precast elements. In the United States, ASTM C1609 is the primary standard for flexural testing of SFRC, and design guidance is available through ACI 544. However, SFRC is not fully integrated into the ACI 318 structural code and full substitution for traditional reinforcement requires engineer-of-record approval and often project-specific performance data. This study presents experimental results from flexural testing of SFRC beams following the EN 14651 and ASTM C1609 standards. The experimental program involved 40 beams measuring 150 mm × 150 mm × 600 mm, produced with concrete of nominal compressive strength 24 MPa and steel fibers with an aspect ratio of 65. Key variables included fiber dosages of 0, 20, 40, and 60 kg/m³, and three types of anchorage (3D, 4D, and 5D). The research compares the parameters defined by EN and ASTM standards and examines how residual flexural tensile strength varies with fiber dosage and anchorage configuration. Based on these results, the study proposes equations for estimating the residual flexural strength of SFRC, supporting its potential for broader structural applications under performance-based design.

Keywords: SFRC, Flexural strength, Residual strength, Hooked-end Fibers.

Biography

Juan Diego Vargas is a Structural Engineer specializing in Earthquake Engineering. He holds a Master's degree in Earthquake Engineering from Imperial College London and has four years of experience across research and industry. Juan Diego has contributed to research on Fiber Reinforced Concrete and Cold-Formed Steel Sections, earning the Best Thesis Award from the Colombian Association of Earthquake Engineering during his undergraduate studies. His current work focuses on non-intrusive structural investigations. He is passionate about integrating research and applied engineering to advance the understanding of structural behaviour.

Monitoring Structures for Durability and Sustainability

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Abstract

The Concrete Durability Monitoring (CDM) system is a groundbreaking technology designed to improve the assessment of concrete durability and service life prediction of structural elements in service situations. By using embedded electrical resistivity and temperaturesensors, the CDM system provides real-time, non-destructive testing for critical factors influencing concrete performance, correlating matrix porosity with chloride ingress and carbonation. The system features models for theprediction of the onset of corrosion, enabling precise service life forecasts for concrete structures in real environmental conditions.

CDM employs advanced predictive models aligned with international standards such as EN 12390-19 for electrical resistivity testing and Eurocode frameworks. These models analyse key transport phenomena, including chloride permeability and carbonation, to ensure compatibility with globally accepted durability benchmarks. The system's electrical resistivity measurements, coupled with temperature data, allow for accurate assessment of long-term concrete performance under real-world conditions, accounting for variables like moisture, chemical exposure, and thermal effects.

Electrical resistivity testing offers several advantages, including cost-effectiveness, rapid execution, and the ability to non-destructively evaluate ion transport resistance. The embedded CDM sensors take this a step further by continuously tracking resistivity trends, which can be used to optimize material mix designs, monitor the effects of supplementary cementitious materials, and improve quality control during construction. Additionally, this data facilitates better lifecycle analysis, linking durability improvements to reductions in maintenance costs and environmental impacts. This comprehensive approach enhances the reliability of service life predictions while supporting a shift toward performance-based durability specifications.

A unique feature of the CDM system is its capacity to enhance sustainability evaluations, particularly in quantifying and improving the carbon footprint of concrete mixes. By incorporating the temporal dimension into lifecycle analyses, CDM enables the calculation of a "CO2 footprint per year of service," offering a more accurate metric for evaluating the environmental impact of concrete over its service life. This approach aligns with the growing emphasis on sustainable construction practices, providing designers and engineers with actionable information to optimize both durability and environmental impact.

Incorporating the CDM system into infrastructure projects not only improves durability management but also supports broader sustainability goals. By providing insights into the relationship between durability, service life, and carbon emissions, CDM equips stakeholders with the tools to design resilient and eco-efficient structures. This capability is especially valuable for addressing the challenges posed by aggressive environments, such as those involving de-icing salts or marine exposure.

In summary, the CDM system represents a transformative advancement in concrete durability and environmental assessment. Its integration of state-of-the-art sensor technology, validated predictive models, and lifecycle carbon footprint analysis positions it as an indispensable tool for modern construction practices focused on durability, sustainability, and cost-efficiency

Keywords: durability, electrical resistivity, non-destructive testing, monitoring.

Sugarcane Bagasse Ash Geopolymer Mixtures: A Step Towards Sustainable Materials

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Abstract

Millions of tons of sugarcane bagasse ash (SBA) are produced as a byproduct by burning sugarcane bagasse in powerplants to run the steam engines for sugar production. This bagasse ash is disposed into landfills effecting their overall capacity. SBA contains very fine particles that can easily become airborne, causing serious respiratory health risks when inhaled. This research study evaluated the utilization of high dosage of SBA for developing geopolymer based "Green" construction materials. An experimental design matrix was developed with varying dosages of SBA (0, 20%, 60%, and 80%) and Na2SiO3/NaOH ratio (0, 0.5, 1, 1.5, 2) based on the response surface methodology. Precursor (consisting of SBA and fly ash) to aggregate ration was kept constant at 30:70 and the alkali to binder ratio was maintained at 0.45 for all the mixtures. Geopolymer samples of size 50.8 x 50.8 mm (2" X 2") were casted and cured at 65oC for 48 hours in a water bath followed by curing at room temperature for 24 hours. The samples were then tested for compressive strength as per ASTM C39. The results revealed that based on varying SBA dosage the compressive strengths ranged from 6.78 MPa to 22.63 MPa. Moreover, the effect of SiO2, Na2O and Fe2O3 on the compressive strength of these mixtures was also evaluated. The results depicted that the compressive strength increased with increasing Na2O and Fe2O3 concentration in the binder. It was also observed that the compressive strength of SBA based geopolymer mixtures improved as the SiO_2 content increased, reaching an optimum at 42%. However, further increase in SiO_2 reduced the strength of the mixtures. The resulting geopolymer mixtures possess compressive strengths according to the requirements set by ASTM standard. Such mixtures can be used as a structural and non-structural element as strong road bases, sidewalks, curbs, bricks for buildings and highway infrastructure. Using industrial SBA in geopolymer based construction materials can address the carbon emissions related to cement production, reduce landfill burden from SBA storage, and mitigate health risks associated with high content of silica in SBA.

Keywords: Compressive strength, geopolymer concrete, green materials, sugarcane bagasse ash.

Land Use Changes in the Border Zone. Case Study of the Polish-Belarusian Border Exemplified by Milenkowce Village

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Abstract

Land use changes are the subject of many studies. Different countries register different land use methods. Land use methods are also defined differently in different countries. The distinguished land use methods depend on, among others, geographical location and historical and economic conditions. The basic public register in Poland constituting a source of information on land use is the real estate cadastre (called the land and building register). This register contains information on the division of land into types according to their actual use. The main objective of the research was to examine the variability over time of the scope of land use functionally related to forest areas. The analyses carried out show the scale of changes in forest areas in the studied area, in particular their scope and area. The study answers the question of whether the dominant land use method changed from agricultural to forest in the analyzed period (1975-2024). Whether climate change influenced land use changes. The research was conducted for the Sokółka district located on the border with Belarus, i.e. the north-eastern border of Poland, which is also the border of the European Union. The data sources used in the study were land use data collected in the real estate cadastre and aerial orthophotomaps. Cadastral (geodetic) data, including the cadastral map from 1975 and data from the land and building register from 2024, were obtained from the District Centre for Geodetic and Cartographic Documentation in Sokółka, Podlaskie Voivodeship. Aerial photos from 2002 and 2024, which allow for determining the actual changes in the use of the studied area, were obtained from a publicly available geodetic portal. The studies showed a slight increase in the forest area at the expense of agricultural land. Therefore, the agricultural character of the district has not changed. The studies showed that agricultural land use still dominates the analyzed area, as it was the case in 1975 and in 2024 despite slight climate changes.

Keywords: land use, land and building register, abandoned agricultural land, climate change.

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Preprocessing on Machine Learning Model for Mapping Land Cover

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Abstract

Landsat imagery obtained by the sensor can experience distortion due to various factors, such as the sensor, the sun, and the atmosphere. Preprocessing of images is carried out to minimize this effect. This research uses remote sensing data originating from Landsat 8, and the image resolution has 15-meter panchromatic and 30-meter multi-spectral spatial resolutions. The preprocessing carried out in this research consists of preprocessing the results of Landsat 8 images using radiometric methods and data preprocessing for machine learning models. Data preprocessing in machine learning models is essential in improving data quality, which can ultimately enhance research outcomes. The potential impact of this research is significant, as it can lead to improved data quality and more accurate land cover mapping, thereby significantly contributing to the field of remote sensing and machine learning. Data preprocessing is carried out before forming a machine learning model. The Quadratic Discriminant Analysis is a machine learning model that maps land cover. Data preprocessing carried out in this research is data cleaning and data reduction. The minimum vector variance method was chosen for the data-cleaning process. The principal component method is used as a dimension-reduction process. This research aims to map the land cover of several areas as water buffer areas for Jakarta, which is the largest and the capital city of Indonesia

Keywords: Data cleaning, Data reduction, Machine learning, Remote sensing.

Comparative Analysis and Modelling of the Compressive Strengths of Basalt Concrete and Granite Concrete

Elizabeth Chinenye Okere
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Abstract

The need to reduce overdependence on most conventional construction materials led to this research. Depletion of our natural resources by continual use can have undesirable effects. Basalt which is an igneous rock was adopted as coarse aggregate in concrete production and the results of the compressive strength tests at different curing ages were compared with that of concrete made with the widely used granite as coarse aggregates. The British Standard concrete mix design method was adopted in obtaining the different mix ratios used in this work. For the case study considered, the results show that basalt can compete favourably with granite in concrete production. Average compressive strength values of 33.1N/mm2 and 29.9N/mm2 were obtained for basalt concrete and granite concrete respectively at 28 days of curing. At age 90 days, basalt concrete has an average compressive strength of 37N/mm2 while granite concrete has a strength of 32N/mm2. A regression-based model was formulated for the prediction of the compressive strength of basalt concrete if the mix ratios are specified and vice versa. Basalt and granite can be used interchangeably in concrete production. This study promises less reliance on granite and the use of basalt in areas where it can be found in abundance.

Keywords: Concrete, Basalt, Granite, Modelling.

Biography

E.C. Okere and D.O. Onwuka are Professors and F.O. Idagu was a doctoral researcher, all in Civil Engineering department at the Federal University of Technology, Owerri, Imo State, Nigeria.

Prognostic Health Management (PHM) and Predictive Maintenance (PdM) for Complex Systems

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Abstract

Maintenance optimization for complex systems is an increasing critical issue in manufacturing industries including automobiles and semiconductors. Using IoT and smart censors, engineers aim to decide proper maintenance time points or intervals via health indicators representing system conditions. In this seminar, I introduce prognostic health management (PHM) and predictive maintenance (PdM) via off-line and on-line data for complex systems. Using off-line data, I present statistical models (e.g., nonhomogeneous Poisson process (NHPP), frailty models) for repairable systems. For PHM, I introduce a general five-stage process for PHM and PdM. I also present condition based maintenance policy using signal processing and statistical process control techniques, based on on-line sensor data. Finally, I present several real case studies for PHM and PdM in power plants and automobiles.

Outline of "Cable-Stayed Bridges Inspection Robot

Tomohiro Iwasaki
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Abstract

Cable-stayed bridges are composed main girders, towers, and stay cables.The stay cables are an important component, and therefore it is extremely important to properly maintain them in order to ensure the high durability. However, as shown in Figure 1, there are many areas where visual inspection is difficult to conduct, such as stay cables running from tall main towers to girders. Therefore, our company developed a cable-stay inspection robot to conduct safe and efficient inspections as shown in Figure 2. This is a self-propelled robot that can do non-destructive inspections of the external appearance of the protective pipes for cable-stays and the condition of the internal steel parts. This device consists of a main unit and an inspection sensor unit. The main unit consists of a driving unit and image sensor (video camera) that inspects deformation of the protection pipe. These units can be moved upward/downward and stopped by self-propulsion via remote control from a personal computer from other locations. This device can efficiently inspect the deformation of protection pipes with the same accuracy as close visual inspection by human inspectors. And if there is any deformation in a protection pipe, the presence or absence deformation of the prestressing steel cables inside the protection pipe can also be easily inspected by using the device. The inspection results are shown in Figure 3.

Keywords: cable-stayed bridge, extradosed bridge, maintenance, non-destructive inspection device.

Figure 1. Cable-stayed bridge (Tomei Ashigara Bridge)

Figure 2. Self-propelled stay-cable inspection device

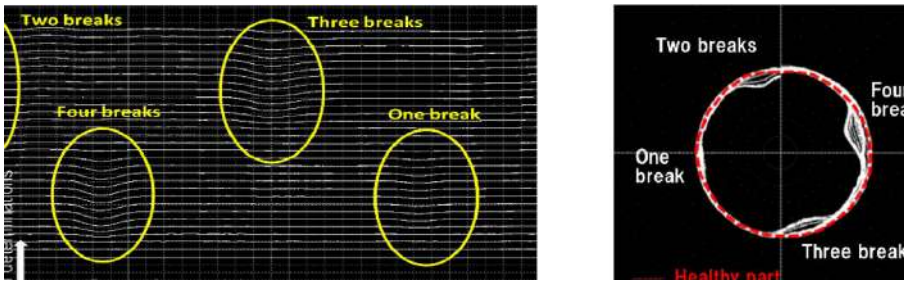

Figure 3. Line and circular waveform detrcted by eddy current test

Refarence:

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Fatigue Durability of Reinforced Concrete Bridge Deck Repair Method

Toshihiko Nagatani
Civil Engineering Department, Central Nippon Highway Eng. Tokyo Co., Ltd, Tokyo, Japan

Abstract

In this study, we compared the water jet removal repair method proposed in [1], which replaces the panel area surrounded by girders and cross beams over a wide area, with the impact removal repair method proposed in [2], which replaces the repair area less than 1 m area, for existing reinforced concrete deck slabs used in Japanese expressway bridges. We confirmed that the durability of the repaired deck slab was improved by repairing the panel area over a wide area using the water jet removal method.

In this experiment, we investigated the fatigue durability of a repair method in which cracks were introduced into the reinforced concrete deck slab and the deck slab was replaced from the top surface. The repair range of the deck specimen was the deck surface of the panel area surrounded by girders and cross beams as shown in Figure 1, and the chamfer depth was from the top surface of the deck to the bottom surface of the rebar laid in the upper layer as shown in Figure 2. The concrete on the top surface of the deck specimen was cross-sectionally repaired using the water jet method, and then a fatigue experiment was conducted to evaluate the progress of deck deformation due to wheel running load after repair as shown in Figures 3 to 5, and the applicability of the repair method was confirmed.

Keywords: Existing concrete bridge deck, Fatigue durability, Wheel load running test, Repair method.

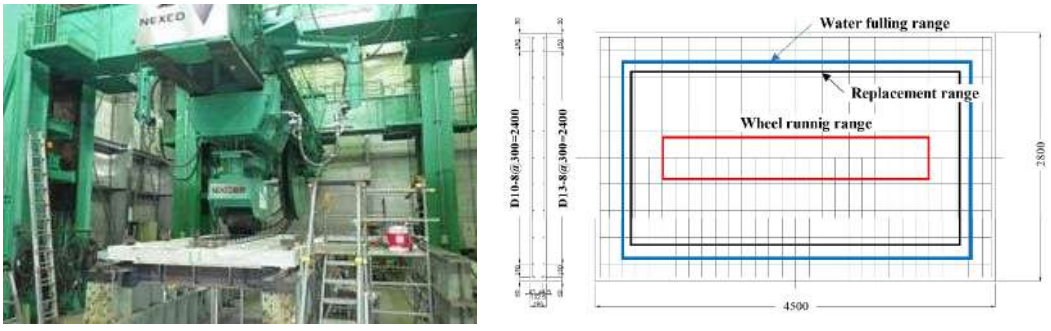


Figure 1. Wheel load running test and Reinforced Concrete Deck Specimen (Water Jet Repair Method)

(Status of Removal work) (After Removal work) (Construction completion status)

Figure 2. Removal work by Water Jet method

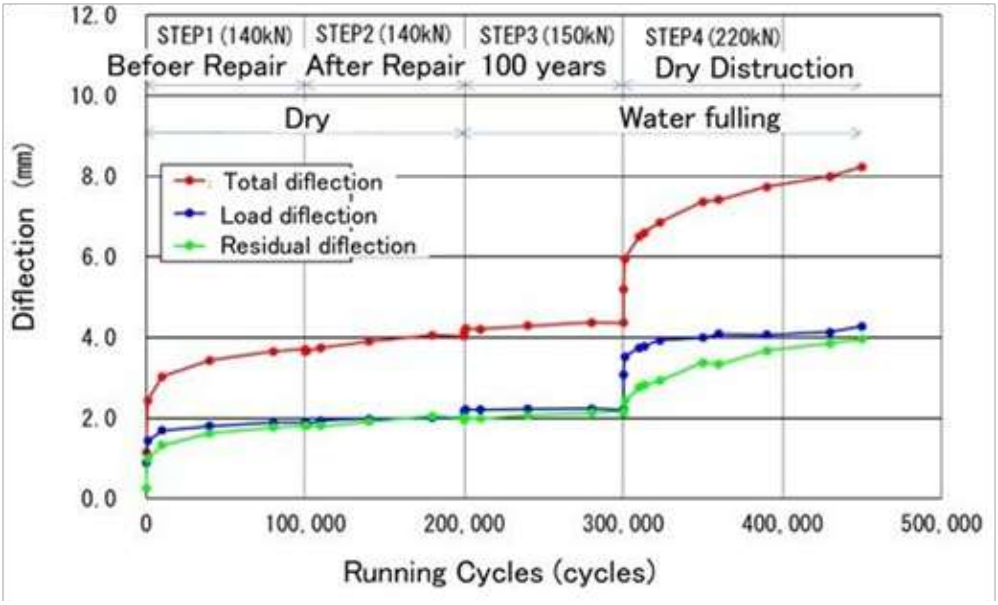
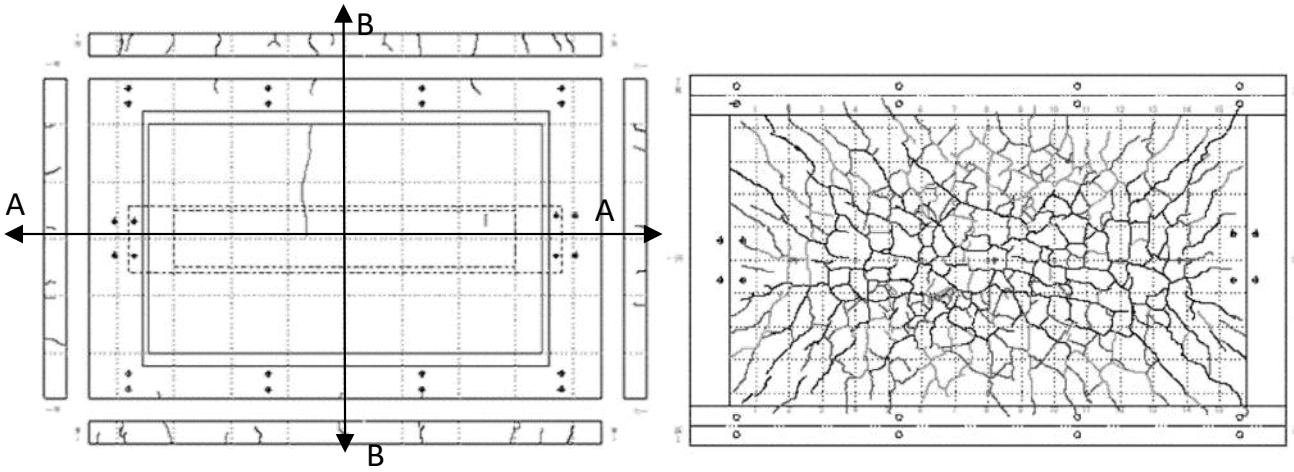


Figure 3. Temporal change of Deck deflection measurement (water Jet Method)



(DeckUppersurface) (DeckBottomsurface)

Figure 4. Cracks on the top and bottom of Deck Specimen at the end of the test (Water Jet Repair Method)

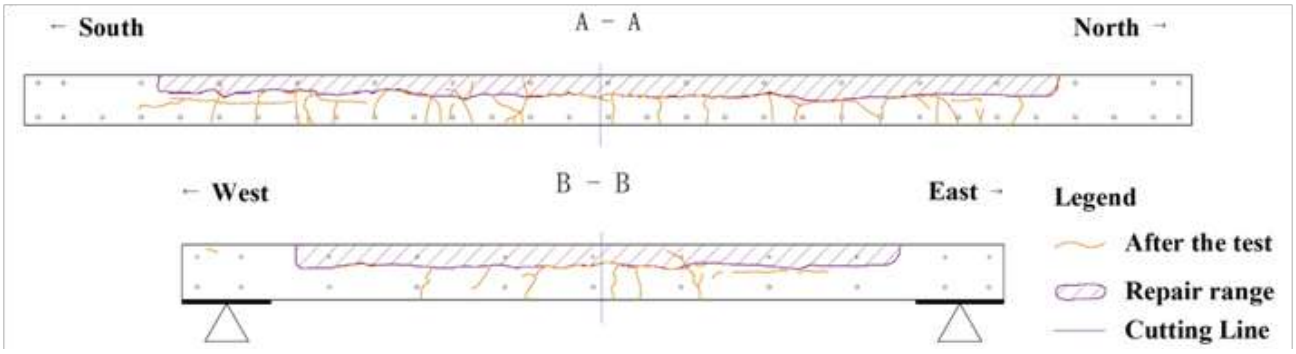


Figure 5. Cutting Surface Deck Specimen, A-A bridge axis direction, B-B bridge axis perpendicular direction

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The Role of Smart Technologies in Shaping Sustainable and Smart Cities

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Abstract

This study examines the pivotal influence of smart technologies on urban planning and construction, emphasising the evolution of smart cities and buildings. Employing a mixed-methods methodology, the research synthesises quantitative data gathered through a structured survey of professionals within the UK construction sector with qualitative insights. It delineates prevalent technologies, such as the Internet of Things (IoT), Artificial Intelligence (AI), and smart grids, assessing their impact on enhancing urban efficiency, sustainability, and interconnectivity. Additionally, the study investigates the prospective capabilities of nascent technologies, including 5G networks, digital twins, and blockchain, providing a forward-thinking analysis of their potential to reshape urban landscapes.

Notwithstanding the opportunities these technologies present, the research identifies critical obstacles, such as concerns over data privacy, elevated costs of implementation, and technical intricacies, which impede their broad-scale adoption. The findings highlight the significant advantages, namely: enhanced sustainability, operational effectiveness, and improved quality of life, which validate sustained investment in smart technologies. The study recommends strategic financial commitments, interdisciplinary collaboration, and a robust focus on ethical considerations to fully realise the transformative potential of smart cities and buildings, thereby fostering innovative and resilient urban ecosystems.

Keywords: Sustainability, Smart Cities, Sustainable buildings, Smart Technologies.

Research on the Whole Process Management of Major Projects in the Field of Ecological Environment

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Abstract

Major projects typically encompass, but are not limited to, infrastructure development, scientific and technological innovation, livelihood security, ecological and environmental protection, and industrial development. These initiatives hold significant strategic importance and profound impacts on the economic and social development of a nation or region. The implementation of major ecological and environmental projects serves as a powerful tool to advance the goals outlined in the 14th Five-Year Plan for ecological conservation, continuously improve environmental quality, deepen the battle against pollution, and expand effective investment in the ecological and environmental sector.

Reflecting on the evolution of major ecological and environmental projects, they exhibit distinct characteristics of their times, demonstrating the critical role of engineering practices over the past five decades in achieving ecological and environmental objectives across different periods. These efforts have also contributed to the gradual formation and development of governance systems in the ecological and environmental field. Whole-process management of major projects represents a contemporary requirement for high-quality ecological and environmental development, serving as a vital means to ensure project quality and effectiveness.

Under the overarching goal of building a Beautiful China, there is an urgent need to advance the high-quality implementation of major projects. This requires strengthening the coordination and planning of ecological and environmental initiatives, promoting whole-process management of major projects, and providing robust support for achieving the objectives of the intensified battle against pollution.

Keywords: New Development Philosophy, Ecological Environment, Major Projects, Beautiful China.

Biography

Zhenyu Ding, female, Research Fellow & Ph.D.Chinese Academy of Environmental Planning, Beijing, China. Her research focuses on whole-process management of major ecological and environmental projects, application of pollution prevention and control technologies, and policy studies. She has conducted extensive exploration into the construction standards, technical policies, and engineering specifications for organizing and implementing national-level ecological and environmental projects.Recognized as a National Top Young Talent in Ecological and Environmental Protection Technology and Leading Expert of the Program (Beijing Shijingshan District).Authored

50+ publications in international SCI/EI-indexed journals and core Chinese journals, and published 11 academic monographs.Holds 7 international invention patents, 27 national invention patents, 45 utility model patents, and 20 software copyrights.Awarded the First Prize of Environmental Technology Advancement Award (China Association of Environmental Protection Industry), Second Prize in the 4th Science and Technology Award (China Association for Science and Technology Industrialization Promotion), and the Youth Science and Technology Award (China Society of Natural Resources).

Building Decarbonization through Circular Economy: A Co-Creative Design Strategy for Regenerative Architecture

Mauro Manca

1Energreen Design S.L., Spain

Abstract

The built environment is responsible for a significant share of global carbon emissions, resource extraction, and waste generation. In this context, decarbonization cannot rely solely on operational energy efficiency—it must also address material flows, construction methods, and end-of-life strategies. This presentation explore show the principles of the circular economy can serve as a transformative framework for building decarbonization, grounded in lifecycle thinking and implemented through a co-creative design approach.

Developed by Energreen Design, the methodology presented proposes as hift from linear and compliance-driven design processes toward Co-Creative Sustainability: a collaborative, multidisciplinary, and iterative strategy that prioritizes adaptability, material reuse, and embodied carbon reduction from the earliest project stages. Far from being a parallel layer of analysis, sustainability becomes the structural core of the design, guiding spatial configuration, material selection, and systems integration.

Through the analysis of emblematic case studies—including Bio Edificio Sócrates (Viladecans),Eductrade Cuatro Caminos, and Viu Sagrada Familia(Barcelona)—the session showcases tangible outcomes of circular construction. These include the use of dry-assembled structural systems, flexible interior layouts, and easily dismountable mechanical installations, all contributing to reduced environmental impact and increased lifecycle value. Quantitative data is presented to demonstrate reduction sinem bodied carbon(acrossA1–C4stages) and potential material recovery value, illustrating how building scan be reconceived as material banks.

Moreover, the presentation highlights tools such as Circular Building Passports, lifecycle carbon analyses, and disassembly audits to support traceability, performance monitoring, and in formed decision-making. It also considers the economic and regulatory Implications of this approach in alignment with the EU Green Taxonomy and emerging ESG frameworks.

By embracing co-creation, lifecycle intelligence, and circularity as core design principles, the proposed methodology not only enhances environmental outcomes but also generates economic and social value. The session aim stop provide architects, engineers, and developers with action able strategies to lead the transition toward regenerative architecture and a truly decarbonized built environment.

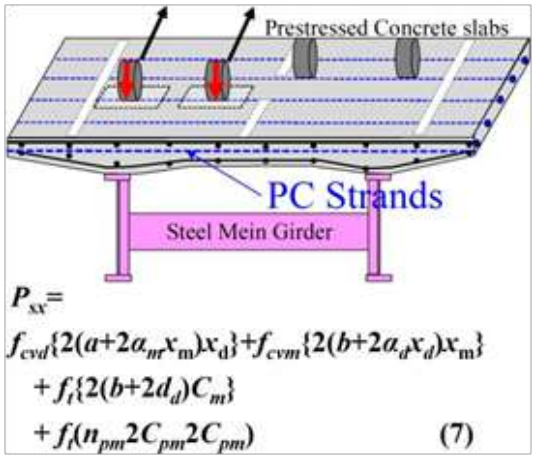
Fatigue Durability Evaluation Method for Prestressed Concrete Deck Road Bridges

Toshihiko Nagatani[1]
Civil Engineering Department, Central Nippon Highway Eng. Tokyo Co., Ltd, Tokyo, Japan

Abstract

This study focuses on a performance evaluation method for fatigue durability of prestressed concrete decks of road bridges. We propose a new performance evaluation method using wheel load running tests for PC decks used for bridge deck replacement on expressways maintained by NEXCO in Japan, and this method is currently stipulated as a required performance for the renewal work.
It was like to introduce some of the results of this research from previously published papers. 1) The first paper [1] summarizes the results of previous studies and proposes a new direction in the evaluation of PC decks. 2) The second paper [2] proposes a new method for calculating the fatigue strength of PC decks by conducting wheel load running tests using a full-scale PC deck.
In renewal works of expressway bridges maintained by NEXCO, PC decks with PC steel members in the lateral direction are adopted as the standard structure for replacement of steel bridge concrete decks. This report develops a performance evaluation method for the fatigue strength of PC decks with fatigue durability of 100 years, and introduces some of the contents of the study.

Keywords: Prestressed concrete deck, Fatigue durability, Wheel load running test, Repair method.



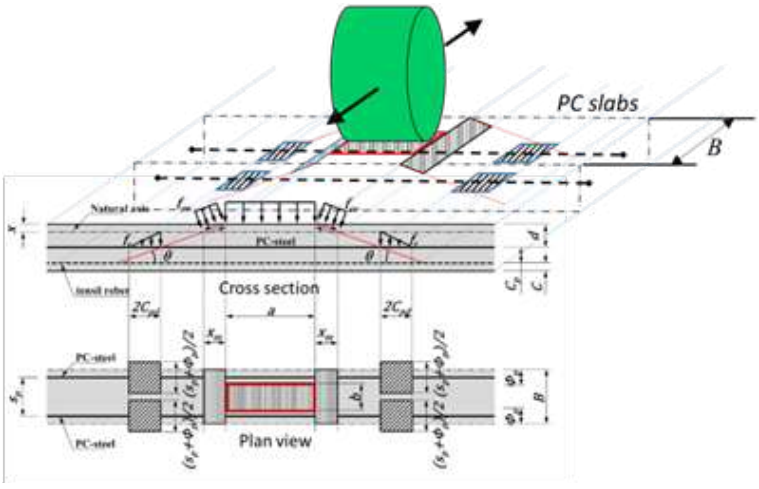


Figure1.Wheel load running test and Dynamic Model of Punching Shear Capacity

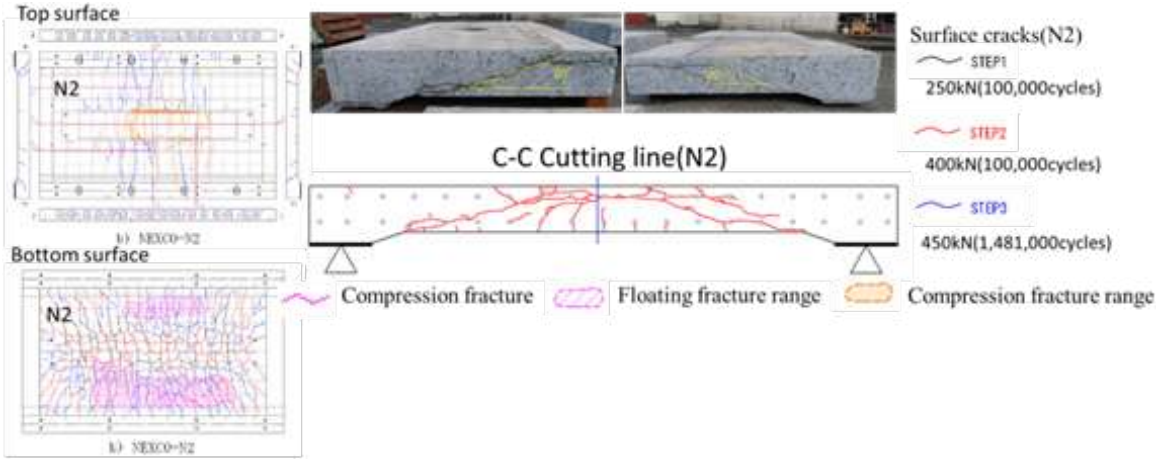


Figure 2. Destruction properties of specimens after wheel load running test

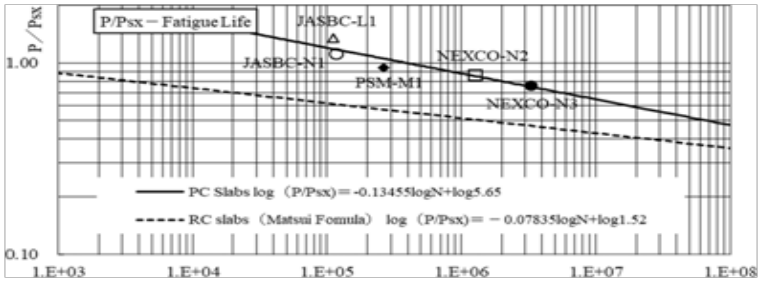
3. Examination of SN Curve of PC Slab

With respect to the results of the wheel load running test of the five bodies shown in Table 1, the pushing shear load bearing capacity Psx of the previous chapter was calculated. Then, the number of repetitions Neq converted to an equivalent wheel load of 250 kN was calculated and displayed on the SN curve diagram in Figure2.This made it possible to propose an SN curve equation(2)for estimating the fatigue durability of PC slabs.

Table1.Psx Calculation results

Specimen No.	BasicLoad P (kN	Compressi-on area Resistance (kN)	PCSteel Resistance (kN)	Psx (kN)	ratio P/Psx	Fatigue Life※N(cy-cles)
NEXCO-N2	450.0	421.1	98.6	519.7	0.866	1,261,389
NEXCO-N3	400.0	424.3	99.7	524.0	0.763	3,279,644
JASBC-L1	372.7	199.0	78.4	277.4	1.344	111,422
JASBC-N1	392.3	236.9	115.1	352.0	1.114	116,112
PSM-M1	490.0	384.4	133.4	517.8	0.946	266,371

*Here,the equivalent number of conversions of fatigue life N is the result of calculation with m=7.43,with basic load P as the maximum load. (JASBC-L1, N1, PSM-M1: Reference)



Fatigue life N (cycles) Figure2.SN curve of the PC slabs

This study focused on the performance evaluation method of PC decks with prestress applied perpendicular to the bridge axis, and conducted wheel load running tests to examine the method of evaluating fatigue durability. As a result, the performance requirement for the precast PC decks after deck replacement was set to 100 years of fatigue durability. From the experimental results, it was derived that the heavy load condition in the wheel load running test is the loading condition that 100,000 repetitions is equivalent to 100 years when the equivalent wheel load is 250 kN.

The results of this study are as follows:

(1) Based on the results of the punching shear failure in the wheel load running test, we proposed a punching shear mechanical model and SN curve for fatigue strength calculation.

(2) We were able to propose test conditions for evaluating the 100-year equivalent fatigue durability of one-side PC decks of road bridges.

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Modeling the Discharge Capacity of the Tigris River Using HEC-RAS: A Study of Manning's Coefficient Calibration between Ali Al-Garbi and Al-ʿAmārah Barrage

Havan H. Salman1 PhD, Maysam Qawmee Khalof2 MSc, Alauldeen Taher Najm3 MSc
1, 2, 3Irrigation Projects Operation and Maintenance Department, Ministry of water resources/Iraq, Baghdad, Iraq

Abstract

This study evaluates the discharge capacity of a 110-kilometer stretch of the Tigris River in southern Iraq, spanning from Ali Al-Garbi to the Al-ʿAmārah Barrage. Accurate modeling of river flow and capacity is critical for managing water resources, and in this context, Manning's roughness coefficient (n) serves as a key parameter that influences model precision. Here, the roughness coefficient is determined through calibration and verification processes, essential for enhancing the fidelity of hydraulic simulations. In this research, Manning's coefficient and the current discharge capacity of the Tigris River are estimated using the HEC-RAS 6.1 hydraulic modeling software. The model is calibrated against observed water levels recorded along the river reach, combined with corresponding flow rates measured at the Ali Al-Garbi gaging station. During the calibration period, from April 1 to April 30, 2019, daily discharge measurements ranged from 790 to 470 m^3/s. Additionally, the model's accuracy is further validated with separate datasets of water levels and discharge collected in February and May 2019.The calibrated Manning's n values for both the main channel and floodplain are 0.03, which yielded a high degree of agreement between observed and simulated water levels and flow patterns along the river reach. Verification results were consistent, confirming the model's robustness and reliability in simulating river hydraulics for this section of the Tigris River. The analysis concluded that the current discharge capacity of the Tigris River between Ali Al-Garbi and the Al-Amarah Barrage is approximately 1,100 m^3/s, a value that provides critical insight into the river's capacity to convey water in its current state.

Keywords: Open channel hydraulics, Manning's roughness coefficient, Flow resistance, Tigris River, Discharge capacity, Calibration, HEC-RAS modeling.

Building Decarbonization through Circular Economy: A Co-Creative Design Strategy for Regenerative Architecture

Mauro Manca

1Energreen Design S.L., Spain

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Buckling Analysis of Cold-Formed Steel Channel Beams with Web Openings Using a Hybrid Improved Element-Free Galerkin–Finite Strip (IEFG–FS) Method

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1. Assistant Professor at Kermanshah University of Technology, Kermanshah, Iran

2. Assistant Lecturer at Al-Furat Al-Awsat Technical University, Technical Institute Kufa, Kufa, Iraq

3. Professor at Isfahan university of Technology, Isfahan, Iran

Abstract

The structural analysis of cold-formed steel (CFS) members with geometric discontinuities, such as web openings, presents significant challenges due to the local effects they introduce and the limitations of traditional mesh-based methods. In this study, a hybrid numerical approach is proposed, combining the Improved Element-Free Galerkin (IEFG) method with the classical Finite Strip (FS) method to investigate the buckling behavior of CFS channel-section beams with web holes under bending loads.

The structure is partitioned into two sub-domains: regions containing openings are modeled using the IEFG method, which offers high accuracy in handling irregular geometries and stress concentrations, while the remaining domain is analyzed using the FS method for its efficiency in modeling prismatic members. The coupling between the two methods is achieved through Lagrange multipliers to ensure continuity of displacement and boundary conditions across the interface.

Numerical results indicate that the proposed IEFG-FS method not only maintains high accuracy but also significantly reduces computational effort up to 50% in some cases compared to conventional approaches. The study further demonstrates that the presence of web openings leads to a notable reduction in the critical moment for buckling, especially in local buckling modes. This reduction ranges approximately from 9% to 33% for local buckling, and to a lesser extent for distortional and global modes. Additionally, it is found that transverse coupling of FS strips to the meshfree domain improves the accuracy of results compared to longitudinal coupling.

Overall, the IEFG-FS approach offers a robust and efficient framework for the buckling analysis of perforated CFS members, making it a valuable tool for structural engineers dealing with complex geometries and local instabilities.

Keywords: Cold-formed steel (CFS) with web openings, Improved Element-Free Galerkin (IEFG), Finite Strip Method (FSM), Lagrange multipliers.

Biography

Dr. Hamed Mousavi is an accomplished Assistant Professor of Structural Engineering at Kermanshah University of Technology, a position he has held since October 2024. With a robust background in structural analysis and design, Dr. Mousavi brings a wealth of academic and practical experience to his role.

He earned his Ph.D. in Structural Engineering from Isfahan University of Technology in 2019, where his doctoral research focused on the innovative "Application of the finite strip method combined with the element-free Galerkin method in solving plate problems." Prior to his Ph.D., he completed his M.Sc. in Structural Engineering at Khajeh Nasir Toosi University of Technology in 2013, with a thesis on the computer simulation of gas shock absorbers in steel frames. He began his academic journey with a B.Sc. in Civil Engineering from Razi University in 2010, graduating as the third-ranked student.

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