DAYANANDA SAGAR COLLEGE OF ENGINEERING

AN AUTONOMOUS INSTITUTE AFFILIATED TO VTU, BELAGAVI

APPROVED BY AICTE AND UGC, ACCREDITED BY NAAC WITH 'A' GRADE & ISO 9001-2015 CERTIFIED INSTITUTION

DEPARTMENT OF CIVIL ENGINEERING

(ACCREDITED BY NBA TIER 1: 2022-2025)

ISDCP-2025

Proceedings and Abstracts

1st International Conference on

Innovation in Sustainable and Digital Construction Practices

(ISDCP-2025)

23rd to 25th January 2025

Organized By

Department of Civil Engineering

Dayananda Sagar College of Engineering

Shavige Malleshwara Hills, Kumaraswamy Layout,

Bengaluru - 560 111

Industrial Partners

Technical Partners

Proceedings and Abstracts

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Kumaraswamy Layout, Bangalore - 560 111
Karnataka, India

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Published by

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PREFACE

The International Conference on Innovation in Sustainable and Digital Construction Practices (ISDCP 2025), organized by the Department of Civil Engineering at Dayananda Sagar College of Engineering in Bengaluru, India, will bring together researchers and experts to explore the intersection of technological advancements across different engineering disciplines. The conference covers the latest developments of the smarter, more sustainable systems, such as smart homes, smart cities, and smart societies thereby underscoring of the interdisciplinary applications of Civil, Electrical, Electronics, Mechanical, Communications and Computer Engineering for the civilized world. By fostering innovation and collaboration, this conference aims to focus on the progress made in different fields of engineering research, such as, construction, sustainability, communication, and digital infrastructure for building the civil engineering structures in the future. There were more than 200 abstracts of the research papers submitted online for the conference. To ensure relevant and high-quality research work, only selected abstracts have been included in this volume. Nevertheless, the abstracts of the keynote speakers have been included as they provide invaluable insights into the development of the engineering science and technology. The conference offers a platform for the local, regional and global engineering researchers for understanding the latest developments in the engineering discipline.

ABOUT DSCE

Founded in 1979 under the Mahatma Gandhi Vidya Peetha Trust, Dayananda Sagar College of Engineering (DSCE) is a premier technical institution in India. Approved by AICTE and affiliated with VTU, DSCE offers 20 undergraduate and 6 postgraduate programs, along with 18 research centers for Ph.D. studies. The campus features advanced laboratories, a Central Library, and a Digital Library, all designed to support academic and research excellence.

The faculty at DSCE are highly dedicated and exemplify professional integrity, ensuring personalized attention and fostering the professional growth of students. Their commitment to academics is complemented by a strong focus on research, as evidenced by numerous sponsored R&D projects from prestigious organizations such as the Department of Science & Technology, Indian Space Research Organization, Defense Research & Development organizations, and AICTE. This robust research orientation positions DSCE as a hub for innovation and academic inquiry. DSCE's quality and relevance in technical education are further validated by its accreditations and rankings. The college has been accredited by NAAC with an 'A' grade and 12 of its undergraduate programs have received accreditation from the NBA, underscoring its commitment to delivering high-quality education. Its prominence is also reflected in various national rankings. As per the NIRF 2024 rankings released by the Ministry of Education, DSCE is placed in the 51-100 rank band for the Innovation Category and the 201-300 rank band among top engineering colleges in India. Furthermore, the institution has been ranked 103rd Nationally and 9th in Bengaluru in the India Today-MDRA 2024 Best College Survey. In The Week's Best College Ranking Survey 2024, DSCE secured the 130th position nationally and ranked 8th in Bengaluru. Additionally, Careers 360 awarded DSCE an impressive AAAA+ rating, reinforcing its standing among India's top engineering institutions.

DSCE's focus on holistic development, cutting-edge infrastructure, research excellence, and high- quality education continues to position it as a premier choice for aspiring engineers and researchers. With a vision of fostering innovation and academic brilliance, the college is dedicated to shaping future leaders and contributing significantly to the field of engineering and technology.

ABOUT THE DEPARTMENT

The Civil Engineering Department at Dayananda Sagar College of Engineering (DSCE), Bengaluru, is renowned for its comprehensive curriculum and state-of-the-art facilities. Established in 1979, the department aims to produce highly skilled and knowledgeable civil engineers. The curriculum includes core subjects such as structural engineering, geotechnical engineering, transportation engineering, environmental engineering, and water resources engineering.

The department has well-equipped laboratories, including those for basic material testing, surveying, concrete technology, soil mechanics and environmental engineering. Additionally, it has advanced software and tools for design and analysis, facilitating practical learning and research. The faculty comprises experienced Professors and industry experts dedicated to imparting quality education and fostering innovation.

DSCE's Civil Engineering Department emphasizes hands-on training through field trips, internships, workshops, and projects. It maintains strong industry connections, providing students with ample opportunities for internships and placements in leading companies. The department also encourages research and development, with students and faculty regularly contributing to national and international journals and conferences.

Overall, the Civil Engineering Department at DSCE is committed to developing proficient engineers who can address contemporary challenges and contribute to sustainable infrastructure development. The department offers doctoral programs in Civil Engineering specializations along with the following PG programs:

- M. Tech (Structural Engineering)
- M. Tech (Highway Technology)

ABOUT THE CONFERENCE

The 1st International Conference on Innovation in Sustainable and Digital Construction Practices (ISDCP-2025) is aimed to address the state-of-the-art multi-disciplinary research needs & interdisciplinary aspects of innovative and sustainable technologies in Advanced construction practices in the form of research papers from industry, faculty, research scholars, and PG/ UG students, along with keynote lectures and a number of invited talks from reputed speakers. The ISDCP, 2025 provides an international platform for all research scholars, practitioners, academicians, students and scientists to discuss and exhibit the latest research developments and discoveries in Digital and sustainable technologies. The conference covers various aspects of Civil Engineering in the following five tracks:

TRACK 1 - DIGITAL CONSTRUCTION PRACTICES

TRACK 2 - GEOTECHNICAL AND TRANSPORTATION

TRACK 3 - STRUCTURES AND MATERIAL SCIENCE

TRACK 4 - ENVIRONMENTAL AND WATER RESOURCES

TRACK 5 - CONSTRUCTION MANAGEMENT

This conference enables us to share and exchange research knowledge & ideas in sustainable & Digital Constructions.

ACKNOWLEDGEMENT

The editors are honored to have facilitated the presentation of key proposals and highlights at the ISDCP, 2025 Conference. This event has captured the attention and enthusiasm of academics and researchers worldwide, establishing itself as a premier platform for showcasing a wealth of innovative research discoveries. The submissions spanned a variety of disciplines, including Environmental Engineering, Structural Engineering, Geotechnical Engineering, Highway Technology, Water Resources Engineering Transportation Engineering and Construction Technology.

We would like to express our sincere gratitude to all the authors who have greatly enhanced the value of the conference with their invaluable contributions, dedicating their time, expertise, and insightful research. The seamless execution of pre- and post-conference activities was made possible through the timely support and guidance provided by our national and international advisory committees, for which we are deeply appreciative. We also extend our profound thanks to all committee members for their invaluable input.

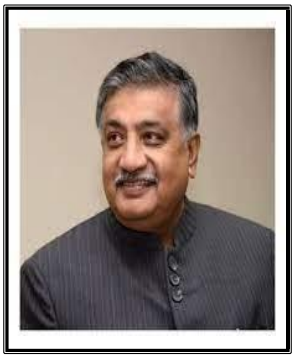
Furthermore, we would like to acknowledge the exceptional efforts of our team of reviewers, whose thorough and critical evaluations of all submissions, along with their feedback and suggestions, played a crucial role in maintaining the high standards of the conference proceedings. A special thanks is due to the organizing committee members, whose relentless efforts were instrumental in making this event a resounding success.

We also express our deepest gratitude to the editorial teams at Emarald Publishing, IOP Publishing, Passer, Springer, Sigma Publishers for their outstanding work in crafting the proceedings and journal in an innovative and intellectually stimulating manner. The ISDCP 2025 conference and its proceedings are poised to receive well-deserved accolades from a large audience.

Finally, our heartfelt thanks go to the Management of Dayananda Sagar College of Engineering, Karnataka, India, and the faculty members of the Department of Civil Engineering for their continued support and encouragement in ensuring the success of this conference.

MESSAGE FROM THE AUTHORITIES

Dr. D Hemachandra Sagar,
Chairman, DSI



Message

I am happy to know that the Department of Civil Engineering is organizing the 1stInternational Conference on Innovation in Sustainable and Digital Construction Practices (ISDCP, 2025) from 23rd to 25th January 2025 at DSCE, Bengaluru, India. Civil Engineering is basic and the most important discipline among many engineering disciplines, that helps to build up the infrastructure stating from housing, urbanization, industrialization to nation-building. In the modern world, the development of innovative, environmentally friendly and sustainable civil engineering structures are necessary to meet the demand from limited availability of earth's resources as raw materials for construction purposes, population explosion and large-scale migration of rural people to cities. I hope this conference serves as a stage for the national and international civil engineers to understand the latest developments in different branches of Civil Engineering from deliberations, discuss societal problems and find suitable solutions for the better future. Nevertheless, this international conference is a good opportunity for the faculty members, research fellows and students to meet many industrialists, policy makers, state and central government officials, national and international delegates to enlighten their knowledge to the global level.

I welcome all delegates to our college for fruitful deliberations and wish for a grand success for the International Conference 'ISDCP-2025'.

Dr. D Hemachandra Sagar, M.B.B.S., M.S**.**
Chairman
Dayananda Sagar Institutions
Banglore-560111

Dr. D Premachandra Sagar
Vice-Chairman, DSI

Message

Dayananda Sagar Institutions have consistently been at the forefront of fostering education from primary school level to highly advanced higher education and research at university level including engineering and medical fields. I am delighted to note that the Department of Civil Engineering is organizing the*1st International Conference on Innovation in Sustainable and Digital Construction Practices (ISDCP - 2025)* at Dayananda Sagar College of Engineering in Bengaluru, India, from 23rd to 25th January 2025.

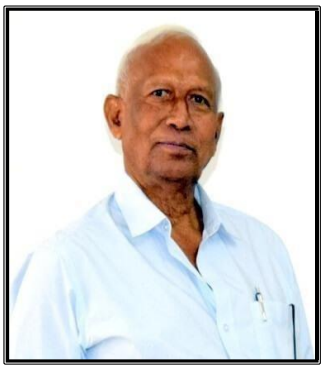
I am sure that the ISDCP - 2025 provides a global platform for research scholars, practitioners, academicians, students, and engineering scientists to exchange their knowledge and research ideas to adopt latest technologies for the construction of civil engineering structures from grass root level to the nation building.

I am optimistic that this conference enriches knowledge to plan for collaborations among the delegates from different parts of the world. This may lead to groundbreaking innovations that can transform the future for sustainable construction technology.

I extend a warm welcome all the delegates to our college and wish for grand success in the civil engineering discipline.

Dr. D Premachandra Sagar
Vice-Chairman
Dayananda Sagar Institutions
Banglore-560111

Shri Galiswamy
Secretary, DSI



Message

I am pleased to learn that the Department of Civil Engineering at Dayananda Sagar College of Engineering is organizing the 1st International Conference on Innovation in Sustainable and Digital Construction Practices (ISDCP-2025) from 23rd to 25th of January 2025 at DSCE, Bengaluru, India.

Dayananda Sagar College of Engineering (DSCE), as a premier educational institution which is renowned for its consistent efforts in hosting impactful conferences that contribute to the growth of research knowledge and innovation. This event offers an excellent platform for researchers and young minds to collaborate, exchange ideas, share their expertise, foster mutual growth and enhance research knowledge.

This kind of conference inspires and empowers both our students and faculty to take up challenging tasks in their academic and professional endeavors. I believe that such initiatives play vital roles in nurturing talent and promoting continuous research and development among the engineering and academic community.

I wish for the grand success of the International Conference ISDCP-2025.

Shri Galiswamy
Secretary
Dayananda Sagar Institutions
Banglore-560111

Dr. B G Prasad
Principal, DSCE

Message

It is commendable to witness the organization of the 1st International Conference on Innovation in Sustainable and Digital Construction Practices (ISDCP-2025) organized by the Department of Civil Engineering from 23rd to 25th January 2025 at Dayananda Sagar College of Engineering, Bengaluru, India.

This conference, with its prime focus on Civil Engineering, is of immense importance as it not only advances knowledge but also fosters innovation, addresses critical challenges in the field of civil engineering and promotes collaboration among diverse stakeholders. Initiatives like this play a pivotal role in shaping the sustainable development in the engineering discipline.

I strongly encourage all delegates to fully engage with this platform, participate in meaningful interactions, and explore the latest technological advancements that are shaping the civilized landscape of the city to the whole country. This is a unique opportunity not only to gain valuable insights but also contribute to global development.

I would also like to sincerely applaud the organizing committee for their dedicated efforts in bringing this event to life. My best wishes to all the participating delegates and research scholars to make use of the best opportunity to shape your career in the future.

Dr. B G Prasad
Principal
Dayananda Sagar College of Engineering
Banglore-560111

Dr. H K Ramaraju
Convener
Vice Principal and Head of the Department

Message

As we navigate in the era marked by rapid transformations in the global sustainable practices and digital constructions landscape, the 1st International Conference on Innovation in Sustainable and Digital Construction Practices (ISDCP-2025) from 23rd to 25th of January 2025 at DSCE, Bengaluru, India.

serves as a vital platform to explore challenges and discover innovative solutions in the fields of Civil Engineering. This conference brings together distinguished researchers, industry experts, academicians, and young minds from across the globe to foster interdisciplinary collaboration and the exchange of groundbreaking ideas.

At Dayananda Sagar College of Engineering, we are committed to advancing excellence in education and research in different branches of Civil Engineering. We are honored to host this event which is not only to focus on technological advancements but also aligns with our core mission of nurturing talent in the minds of young people. I am confident that ISDCP-2025 will trigger meaningful discussions, cultivate discussions and partnerships to plan for the future.

I encourage all participants to take full advantage of this unique opportunity to connect, learn, and contribute to the development of civil engineering discipline.

I hope this conference provides a fruitful and a memorable experience for enhance your knowledge in your career!

Dr. H K Ramaraju
Vice Principal and Head
Department of Civil Engineering
Dayananda Sagar College of Engineering
Banglore-560111

Schedule

Paper_ID	TITLE	TRACK	DATE	TIME
DAY - 1				
INAUGURATION				**10:00 AM - 01:00 PM**
LUNCH				
Key Note Address			23-01-2025	02:00 - 03:20 PM
ISDCP_003	Comprehensive Road Safety Audit and Blackspot Analysis for Enhanced National Highway Safety: A Data-Driven Approach for NHAI	2		03:20 - 03:30 PM
ISDCP_008	The Study of Remedial Measures on Highway Pavement Failures	2		03:30 - 03:40 PM
ISDCP_010	Managing Pavement Distress: A Case Study on National Highway from Maroor to Garladinne	2		03:40 - 03:50 PM
ISDCP_011	Trends and patterns of railway accident in India: A study of the post-Independence Era	2		03:50 - 04:00 PM
ISDCP_036	Impact of Intersection Design and Traffic Management on Pedestrian and Vehicle Behaviour: A Review	2		04:00 - 04:10 PM
ISDCP_070	Effect of Bio-Enzyme on Swell Characteristics of Black Cotton Soil	2		04:10 - 04:20 PM
ISDCP_082	A Comprehensive Review of Speed Hump Design, Effectiveness, and Optimization Strategies for Traffic Safety	2		04:20 - 04:30 PM
ISDCP_101	Trends and patterns of railway accident in India: A study of the post-Independence Era	2		04:30 - 04:40 PM
ISDCP_102	Digital Dynamic Cone Penetrometer (DCP) for Pavement Evaluation	2		04:40 - 04:50 PM
ISDCP_108	The Impact of Real Time Adaptive Traffic Control System (ATCS) with Vehicle Actuated Control (VAC) on Urban Traffic Congestion: A Systematic Review	2		04:50 - 05:00 PM
ISDCP_110	Investigation on Marshall Characteristics of Bituminous Mixes with Utilization of Areca Fiber and Stone Dust as Filler Material	2		05:00-05:10 PM
ISDCP_111	Eco-Friendly Geopolymer Paver Blocks Using Recycled Aggregates for Light Traffic Roads	2		05:10-05:20 PM
DAY - 2				
ISDCP_122	Solid Waste Management in Chikkaballapura City: Challenges, Opportunities and Sustainable Solutions	4	24-01-2025	11:00 - 11:10 AM
ISDCP_001	Prediction of Compressive strength of Fly Ash Based Geopolymer Concrete Using Support Vector Regression	3		11:10 - 11:20 AM

ISDCP_002	Harnessing Olivine Sand for Sustainable Concrete: Enhancing Strength and Durability Through Cement and Aggregate Replacement	3		11:20 - 11:30 AM
ISDCP_004	Forecasting of mechanical properties of banana fibre reinforced concrete using Artificial Neural Network	3		11:30 - 11:40 AM
ISDCP_005	Effect of partial binder replacement on the properties of cement based concrete mixes incorporating industrial wastes as aggregates	3		11:40 - 11:50 AM
ISDCP_007	Compressive Strength Prediction of SCC using ANN	3		11:50 AM - 12:00 PM
ISDCP_009	Seismic Response of Cooling Towers for Fixed Base and Column Supports	3		12:00 - 12:10 PM
ISDCP_014	Influence of Flax Fiber as Additional Material on Strength of Concrete	3		12:10 - 12:20 PM
ISDCP_015	An Empirical & Analytical Study on Composite RC Beams with Bentonite Clay and Wheat Straw Ash as Partial Substitutes in Cement	3		12:20 - 20:30 PM
ISDCP_016	Microplastic Degradation by Electrocoagulation Process as a Review Article	3		12:30 - 12:40 PM
ISDCP_017	Examining the Properties of Concrete with Implementation of Bentonite Clay and Wheat Straw Ash as Partial Substitutes in Cement	3		12:40 - 12:50 PM
ISDCP_019	Effectiveness of Hybrid Fibres for Enhancing the Bond Capacity Between Sand Coated GFRP Rebar and Concrete	3		12:50 - 01:00 PM
ISDCP_069	Eggshell and Fish Scale Powder as Biomaterials in Concrete: A Step Towards Sustainable Infrastructure	3		01:00 – 01:10 PM
ISDCP-104	Vermicomposting - An eco-friendly approach towards Sustainable Agriculture	4		01:10 - 01:20 PM
ISDCP_022	Evaluation of Flexural Behaviour of GFRP-Reinforced Concrete Beams with Coconut Fiber Reinforcement	3		03:00 - 03:10 PM
ISDCP_031	Use of RAP and Egg Shell Powder in Self-Compacting Concrete	3		03:10 - 03:20 PM
ISDCP_057	Performance Study on Cement Grout Bituminous Pavement by Using GGBS, Fly Ash, Rice Husk Ash and Silica Sand	3		03:20 - 03:30 PM
ISDCP_059	Application of Recycled Aggregates in Cement Treated Base Course	3		03:30 - 03:40 PM
ISDCP_061	Experimental Analysis of Mechanical Properties on Cement Grouted Bituminous Mixture	3		03:40 - 03:50 PM
ISDCP_071	Use of Plastic Aggregates in Concrete by Partial Replacement to Natural Granite Coarse Aggregates	3		03:50 - 04:00 PM
ISDCP_074	Impact of Performance Assessment of Mono-Column and Floating Column Structures on Varying Terrain	3		04:00 - 04:10 PM

	Conditions with Identical Plan Area under Seismic Forces			
ISDCP_075	Green Paving Solutions: Economical Concrete Mix Design with Iron Ore Tailings and GGBS	3		04:10 - 04:20 PM
ISDCP_078	Desalination using Reverse Osmosis Scope of Power Generation and the Potential Benefits of Estuarine Water Comparted to Sea Water	3		04:20 - 04:30 PM
ISDCP_080	An Experimental Analysis of Artificial Aggregate using Granite Dust and Fly ash	3		04:30 - 04:40 PM
ISDCP_081	Analysing Structural Performance for Concrete-Filled Steel Tube Members	3		04:40 - 04:50 PM
ISDCP_085	Investigation of Composite Column Compression Behaviour using Experimentation and Data-Driven Modelling	3		04:50 - 05:00 PM
ISDCP_150	PCM Based Lime Mortar to Enhance Energy Efficiency of Building by Adding Light Weight Aggregate	3		05:00 - 05:10 PM
ISDCP_043	Decreasing Trend of Rainfall by the Enhancement of Human Activities in the Southern Coastal Karnataka	4		05:10 - 05:20 PM
DAY – 3				
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ISDCP_093	Analysis of Load Carrying Capacity of RCC Columns by Varying the Conventional Quantity of Cement Concrete	3		10:50 - 11:00 AM
ISDCP_094	Experimental Study on Transparent Concrete using Rice Husk Ash and Glass Optical Fibers	3		11:00 - 11:10 AM
ISDCP_095	Effect of Use of Banded Hematite Jasper (BHJ) and Reclaimed Asphalt Pavement (RAP) in Bituminous Concrete Grade-I Mix	3		11:10 - 11:20 AM
ISDCP_096	Waste Paper Concrete	3		11:20 - 11:30 AM
ISDCP_097	A Study on Interface Failure Behaviours in Recycled Coarse Aggregate Concrete Under Flexure With DIC	3		11:30 - 11:40 AM
ISDCP_099	Confinement Effect in Short CFST Columns Filled with Recycled Aggregate Concrete: An Experimental Study	3		11:40 - 11:50 AM
ISDCP_100	Assessment on Leachate Characteristics of Red Mud Stabilized with Fly Ash and Ground Granulated Blast Slag in Subgrade Applications	3		11:50 AM - 12:00 PM
ISDCP_105	Behaviour of Steel-Concrete Composite Columns under Axial Compression	3		12:00 - 12:10 PM
ISDCP_115	Assessment of Mechanical Properties of Sustainable Concrete Made of Dry Sewage Sludge	3		12:10 - 12:20 PM

ISDCP_135	A study on densification of Interfacial Transition Zone (ITZ) of Concrete using Epoxy-Coated Aggregates in Cement Matrix	3		12:20 - 12:30 PM
ISDCP_138	Analysis Of Load Carrying Capacity of RCC Columns by Varying the Conventional Quantity of Cement Concrete	3		12:30 - 12:40 PM
ISDCP_032	The SAFER Diamond – A Gem of a Tool for Risk Assessment	1		12:40 - 12:50 PM
ISDCP_067	Harnessing GIS Mapping for Sustainable Urban Development and Digital Integration	1		12:50 - 01:00 PM
ISDCP_083	Water Quality Index Development using Fuzzy Logic, A Case Study of the Karanja River of Karnataka, India	4		01:00 - 01:10 PM
ISDCP_041	Sustainable Reuse of Secondary Treated Sewage Water for Concrete Manufacturing: A Review	4		01:10 - 01:20 PM
LUNCH				
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ISDCP_013	Sustainable Municipal Solid Waste Management in India by Biomethanation Process	4		02:50 - 03:00 PM
ISDCP_018	Soft Computing for Comparative Analysis of Fuzzy Logic and ANN Models for Estimating Daily Reference Evapotranspiration with Limited Meteorological Inputs	4		03:00 - 03:10 PM
ISDCP_091	An Experimental Analysis for Turbidity Removal of Lake Water using Natural Coagulant – A Sustainable Approach	4		03:10 - 03:20 PM
ISDCP_092	The Impact of Sewage Discharge on Groundwater Quality in the Vicinity of the Municipal Sewage Treatment Plant in HBR Layout, Hunnur, Bengaluru.	4		03:20 - 03:30 PM
ISDCP_023	Studies on Removal of Hexavalent Chromium using Novel Carbonaceous Cubic Spinel Ferrites as a Nano Adsorbent	4		03:30 - 03:40 PM
ISDCP_024	Explanatory Studies on Cost Effective Polymeric Nanocomposites for Removal of Fluoride Ions from Ground Water	4		03:40 - 03:50 PM
ISDCP_072	Colour Removal from Wastewater using Dried Tender Coconut Derived Activated Carbon	4		03:50- 04:00 PM

Program Flow

Inauguration of the 1st International Conference at 10:00 AM Innovation in Sustainable and Digital Construction Practices (ISDCP 2025)

Schedule	Session	Keynote Speaker	Title	Chair	Co-Chair
23-01-2025	10:00 AM-11:30 AM	Inauguration			
	11:45 AM - 1:00 PM	Dr. C Rajasekara Murthy, Senior Scientist, Centre for Inland Waters, Canada The Water Sustainable City of the Future			
	TRACK 1 - DIGITAL CONSTRUCTION PRACTICES				
	2:00 PM - 5:00 PM	Dr. N. Krishnamurthy, Safety Consultant and Trainer, Singapore	Computer Applications in Forensic Civil Engineering	Dr. Asha K, Professor, BMSCE, Bengaluru	Dr. Shiva Kumar G, Associate Professor, DSCE, Bengaluru
24-01-2025	**TRACK 2 - GEOTECHNICAL AND TRANSPORTATION**				
	10:00 AM - 1:00 PM	Dr. Chamod Hettiarachchi, Senior Lecturer, University of Moratuwa, Sri Lanka	Warm Mix Asphalt: The Key to Greener, More Resilient Infrastructure	Dr. Ramesh H, Professor, NITK, Surathkal	Dr. Sunil S, Professor, RVCE, Bengaluru
	TRACK 3 - STRUCTURES AND MATERIAL SCIENCE				
	2:00 PM - 5:00 PM	Er. Kumar Ramaswamy Associate Director, AECOM, Melbourne, Australia	Fenton Street Footbridge-Architectural and Structural Design	Dr. Jyothi T K, Professor, GCE, Ramanagara	Dr. Shanthi V, Associate Professor, DSCE, Bengaluru
25-01-2025	**TRACK 4 - ENVIRONMENTAL AND WATER RESOURCES**				
	10:00 AM - 1:00 PM	Dr. Leena Shevade, Water Resource Engineer, Boomi Environmental Services, Pennsylvania, USA	Resilient by design: frameworks and case studies	Dr. Narendra Reddy, Professor, CIIRC, Bengaluru	Dr. B R Manjunath, Professor, DSCE, Bengaluru
	TRACK 5 - CONSTRUCTION MANAGEMENT				
	2:00 PM - 5:00 PM	Dr. Lilia Lillian G Magison, Associate Professor, Universiti Malaysia Sabah, Malaysia	From Traditional to Transformational: Reinventing Road Materials for Sustainability	Er. R P Mallik, Chairman, IPHE, Karnataka	Dr. G P Shivashankara, Professor, DSCE, Bengaluru

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ABSTRACTS

TRACK 1 - DIGITAL CONSTRUCTION PRACTICES

ISDCP-032

The SAFER Diamond – A Gem of a Tool for Risk Assessment

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Abstract

SAFER ('*Safe and Feasible Exponential Risk'*) Diamond offers a novel digitized method for risk assessment, with an interactive graphical presentation of data and results. The method is patented in Singapore and copyrighted in India. It is based on conventional determination of risk as product of values of likelihood of occurrence of a mishap, and severity of its consequences. However, computer procedure for the calculation of risk differs considerably from existing methods: 1. Input lowest and highest known or expected values of some measure of likelihood and some measure of severity. 2. Input lower and higher bounds of tolerability of risk outcome. 3. Program displays chart of variations from lowest to highest values of likelihood and severity along ±45 degrees to vertical in log-log percentage scales in a diamond shape, with vertical axis denoting risk outcome in percentage. 4. Input of any combination of likelihood and severity will locate the risk on the chart, visibly indicating acceptability or otherwise of risk. Main advantage is freedom from having to make arbitrary decisions on divisions of likelihood, severity and risk into a fixed number of step functions.

Keywords: extreme values, severity, vertical axis risk

ISDCP-067

Harnessing GIS Mapping for Sustainable Urban Development and Digital Integration

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Abstract

This research explores the application of Geographic Information Systems (GIS) in the urban planning and development of Panjim City, emphasizing digital transformation and smart infrastructure integration. GIS technology allows for capturing, storing, analyzing, and presenting spatial data, serving as a vital tool for city planners to visualize patterns, assess current conditions, and drive sustainable growth. The study focuses on key aspects of urban development, such as mapping land use, analyzing transportation networks, and evaluating environmental impacts. It also includes a comprehensive analysis of Panjim's Road network and utility infrastructure, identifying areas with poor road conditions, traffic congestion, and drainage inefficiencies. Additionally, environmental assessments will map natural habitats and examine the effects of urbanization on sensitive areas like wetlands and coastal zones. In its future scope, the research proposes leveraging GIS for smart infrastructure development, with a focus on intelligent transportation systems, smart utilities, and cultural preservation through digitization. The potential to create an urban digital twin for Panjim will also be explored, enabling real-time monitoring of environmental conditions and simulating urban dynamics to guide future developments. Ultimately, this research highlights the transformative potential of GIS in fostering sustainable urban growth, integrating innovative digital solutions, and creating future-ready cities while preserving cultural heritage.

Keywords: digital transformation, smart infrastructure development, GIS, digital solutions

ISDCP-103

Tackling Barriers to the Adoption of GPT Language Models in the Construction Industry: A Fuzzy DEMATEL Approach

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Abstract

The construction industry faces innovation and productivity issues that have further complicated the integration of advanced technologies. GPT, particularly Generative Pre-trained Transformer (GPT) models, presents potential solutions, but challenges such as latency, lack of skill sets, and data compatibility impede its deployment. Notwithstanding the growing interest in GPT, there remains a deficiency of comprehensive studies regarding adoption problems and their interrelations. This work seeks to fill this research vacuum by employing the Fuzzy Decision-making Trial and Evaluation Laboratory (DEMATEL) method to identify the causal relationships among the issues hindering GPT implementation in the construction sector. The findings indicate that the primary contributors to additional complex challenges are latency concerns (C13), skills and training (C7), and data interoperability (C2). The primary consequences identified are these factors, which substantially influence matters such as infrastructure requirements and costs (C8), hallucinations (C1), confidentiality, and intellectual property (C4). These findings establish a strategic framework to mitigate these adoption challenges. These difficulties primarily stress tackling the basic issues through targeted interventions and pragmatic solutions. By prioritizing latency, facilitating skill development, and ensuring better data integration, the framework aims to reduce broader obstacles and promote a smoother adoption of GPT models. Addressing these fundamental challenges is crucial to resolving the broader issues related to GPT adoption. The proposed strategic framework seeks to enhance operational efficiency and foster innovation in the construction sector, providing valuable guidance to industry stakeholders.

Keywords: Challenges, Fuzzy sets, DEMATEL, Construction Industry, GPT

ISDCP-044

IoT-Enhanced Seismic Response Monitoring of Steel Structures

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Abstract

The seismic resilience of steel structures is critical for safeguarding infrastructure and human lives in earthquake-prone areas. This study explores the integration of Internet of Things (IoT) technology with shake table testing to enhance the seismic resilience of steel structures. Using an array of IoT sensors—this approach enables real-time data collection and monitoring of structural behaviour under simulated earthquake conditions. The data generated is transmitted wirelessly to a centralized system, providing insights into critical parameters like acceleration, strain, and deformation. By analyzing these data, engineers can identify potential weaknesses, validate design assumptions, and implement targeted adjustments to improve structural resilience. The IoT-enhanced system allows for predictive analysis and real-time decision-making, which is essential for adaptive responses in actual seismic events. This integration not only advances precision in shake table testing but also

facilitates ongoing Structural Health Monitoring (SHM) for post-test applications. Overall, the study demonstrates that IoT-enabled shake table testing holds promise for designing, testing, and maintaining earthquake-resistant steel structures, ensuring safety and reducing future repair costs in real-world scenarios.

Keywords: Seismic response, sensors, IoT, SHM

ISDCP-113

Forecasting Mysuru's Real Estate Trends in 2034: Integrating Geoinformatics to Analyse Growth Factors

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Abstract

Mysore in the recent year has witnessed rapid urban growth and infrastructural development leading to dynamic changes in its landscape. This paper develops a relation between urban growth and property values, using data from 2014 to 2024 and predicting the property value of 2034 through Random Forest regression model. The study considers 110 key locations for analysis considering the factors like proximity to the central business area, railway station, bus stand, and local amenities like school and hospitals. This gathering creates a strong correlation between guideline values and market values, helps in shaping real estate dynamics. Further distance from central business area, bus stop, railway station shows significant factor of property values, reflecting the influence on market value. A significant rise in property values is projected and estimated a significant increase of 118% by 2034. This indicates Mysore's economic development and its ability to sustain growth over time. Notably, this growth is further increased by the construction of new expressway between Mysore and Bengaluru to enhance accessibility between the two cities. These results help the real estate market to inculcate decisions concerning future property values accommodating urban development.

Keywords: Urban growth, Market values, Random Forest Regression Model, Proximity, Guideline Value

ISDCP-035

Study on Driver Behavior to Assess Safety at Various Unsignalized Intersections using Fuzzy and ANN in an Urban Area

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Abstract

In the Indian scenario, mixed traffic condition is seen, all vehicles use one lane, and the walking of pedestrians is a common sight being observed at the intersection. At an unsignalized junction, vehicles usually ignore lane discipline and rules of priority and tend to cross the junction without considering existing traffic. Due to this action, there is a risk of an accident, which affects the vehicle movement and capacity of the intersection. Therefore, it is very important to study driver behavior which is very

complex and it is influenced by traffic and vehicle characteristics. This paper deals with driver behavior at unsignalized intersections analysed using fuzzy logic. Data from the study area is collected from videos recorded at an unsignalized T intersection for a duration of 1 h during peak hour. Recorded videos are played again for data extraction. Data like vehicle count and type, approach speed, size of gaps, accepted and rejected gaps are known. Models are developed in fuzzy logic using MATLAB with input as accepted gaps, vehicle speed and vehicle type to get the output of drivers' choice as accepting or rejecting the gap. 50% of the data is used for modeling and model evaluation is carried out using 50% of the data. The models developed can be applied to different intersections with similar characters.

Keywords: Driver Behavior, Unsignalized intersections, Fuzzy logic, Artificial Neural Networks (ANN), Descriptive Statistics, conflict model

ISDCP-038

Identification of Weathered and Fractured Zones using Electromagnetic (EM) Method

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Abstract

The invention pertains to a method for the identification of weathered and fractured zones in subsurface layers using the Electromagnetic (EM) method, aimed at enhancing the planning and execution of civil engineering projects. The method involves the deployment of EM equipment to measure variations in subsurface electrical conductivity, which are indicative of geological anomalies such as weathered or fractured zones. The procedure includes site selection, equipment calibration, systematic data collection along predefined grids, and subsequent data processing to generate detailed subsurface conductivity maps. These maps help identify areas of compromised subsurface integrity, which are critical for ensuring the safety and stability of structures like buildings, bridges, and roads. The EM method is non-invasive, cost-effective, and efficient, offering rapid coverage of large areas with minimal environmental disruption. The invention provides a reliable tool for early detection of subsurface risks, thereby supporting informed decision-making in geotechnical and civil engineering design.

Keywords: Weathered Zones, Fractured Zones, Electromagnetic (EM) Method, Subsurface Investigation.

ISDCP-128

Performance Evaluation of Retrofitted Reinforced Concrete Structures by Machine Learning

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Abstract

This collection of studies explores innovative strategies and technologies aimed at improving the seismic resilience of buildings, with a focus on high-rise structures subjected to dynamic forces such as earthquakes and wind. Several studies examine the optimization of damping systems, including the strategic placement of Viscous Wall Dampers (VWDs) and Base Isolators using metaheuristic algorithms (e.g., Bat Algorithm, Dragonfly Algorithm, Particle Swarm Optimization, and Gravitational Search Algorithm). These studies demonstrate that distributing dampers across multiple floors or throughout the entire structure enhances seismic stability and reduces undesirable structural movements. Machine learning (ML) techniques also emerge as a powerful tool for predicting seismic

responses and optimizing structural performance. Key application includes predicting seismic performance (story displacements and inter-story drift) of reinforced concrete moment-resistant frames (RC MRFs). Additionally, the use of data-driven dynamic load identification algorithms, such as deep learning and artificial neural networks (ANNs), is explored for more accurate seismic load reconstruction. Collectively, these studies highlight the transformative potential of optimization algorithms, machine learning, and advanced damping technologies in modern seismic design, paving the way for more resilient and cost-effective solutions for tall buildings in seismically active regions.

Keywords: Reinforced Concrete structure; Optimization; Dampers; Base Isolators; Machine Learning; Artificial neural network

TRACK 2 - GEOTECHNICAL AND TRANSPORTATION

ISDCP-003

Comprehensive Road Safety Audit and Blackspot Analysis for Enhanced National Highway Safety: A Data-Driven Approach for NHAI

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Abstract

Road safety is a critical concern for transportation authorities worldwide, with the National Highway Authority of India (NHAI) taking proactive measures to address road accident risks on national highways. In this study, we conducted a comprehensive Road Safety Audit (RSA) to analyze road accident data, identify blackspot locations, ranking the blackspots, and provide recommendations to NHAI for enhancing road safety through checklist measures. The objectives of our project were fourfold: first, to analyze road accident data on national highways; second, to identify blackspot locations using indices; third, to rank the blackspots by analysis methods; and fourth, to provide reports and recommendations to NHAI by the help of checklist. Our methodology involved selecting a study area, collecting data, conducting site inspections, identifying hazards, analyzing accidents, and ranking blackspots. Key findings from our blackspot analysis revealed the identification of blackspot locations and rankings using two methods: Weighted Severity Index (WSI) and Accident Severity Index (ASI). The analysis identified the top 15 overall stretch blackspots using both methods, providing valuable insights into areas of high accident risk. Overall, this study contributes to the ongoing efforts to improve road safety on national highways, offering actionable recommendations to NHAI based on data-driven analysis and evaluation of risk factors. By prioritizing blackspot locations and implementing targeted interventions, NHAI can work towards reducing road accidents and enhancing safety for all road users.

Keywords: Road safety audit, Blackspots, Weighted severity index, Accident severity index

ISDCP-008

The Study of Remedial Measures on Highway Pavement Failures

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Abstract
Socio-economic development of a country depends on an efficient transport system. Due to the rapid expansion in the road network, unavailability of quality of the material, equipment, skilled labour, poor funds allocation and mainly environmental weather conditions of the country have all added complexities to the problem of highway pavements. Maintenance of the road networks involves a variety of operations such as identification of the deficiencies and planning, programming and scheduling for the actual implementation in the field and monitoring. The essential objective should be keeping the road surface and appurtenances on good condition and to extend the life of the road assets to its design life. The purpose of the proposed study is to discuss the possible causes of pavement failures, recommend preventive measures to causes of failure in highway pavements.

Keywords: Road network, Road deterioration, Remedial action

ISDCP-010

Managing Pavement Distress: A Case Study on National Highway from Maroor to Garladinne

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Abstract

A strong transportation infrastructure is crucial for a nation's progress, but pavement deterioration causes challenges, including traffic delays and safety risks. Developing nations, like India, face pavement issues due to factors such as axle loads, drainage problems, poor materials, and majorly due to inconsistent maintenance can be accessed through the Pavement Condition Index. This study concentrated on identifying distress factors to evaluate and quantify the general pavement condition in the urban highway networks from Maroor to Garladinne within the NH-44 sector, situated 50 kilometers from the center of Anantapur city. The severity and type of distresses were assessed to determine the appropriate repair and rehabilitation operations needed to extend the design life of the existing pavement. The selection of the rehabilitation and repair approach was based on the Pavement Condition Index (PCI) as per IRC 82-2015 and DIM. A comprehensive visual condition survey was conducted on the chosen stretch within the NH-44 sector, spanning from Maroor to Garladinne, situated 50 kilometers from the center of Anantapur city. Distresses on the pavement were identified and measured according to relevant standards during this detailed survey. PCI, determined by Micro Paver 5.2.3, is crucial for devising cost-effective pavement maintenance strategies. It enhances engineers' skills in managing maintenance for optimal serviceability with minimal cost and travel time. Micro Paver 5.2.3 calculates PCI from individual survey data on a scale of 0 to 100, signifying poor to optimum conditions. The Anantapur urban highway (Maroor to Garladinne, NH-44) exhibits favorable PCI values of '90' (IRC 82-2015) and '92' (DIM), signifying good pavement condition. While overlay rehabilitation is unnecessary, rehabilitation is recommended for the 1 to 2 km sample unit as per IRC 82-2015. The study advocates routine maintenance operations and shares pertinent details with Anantapur's municipalities and NHAI for effective routine maintenance strategies and operations.

Keywords: Pavement Condition Index, Routine maintenance operations, Micro PAVER 5.2.3, Distress

ISDCP-011

Trends and Patterns of Railway Accident in India: A Study of the Post-Independence Era

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Abstract

This comprehensive study examines the history of railway accidents in India since 1947, with a focus on identifying trends, patterns, and causes of accidents. The research analyzes official data and reports from Indian Railways, government agencies, and other sources to provide a detailed understanding of railway safety in India. The research provides a foundation for understanding the complexities of railway safety in India and informs strategies for improving safety measures, reducing accidents, and enhancing passenger trust.

Keywords: Derailment, Collision, Safety

ISDCP-020

Stabilization of Black Cotton Soil using Flue Gas Desulfurification Gypsum

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Abstract

Unstable soil poses challenges for highway construction. We explored Flue Gas Desulfurization (FGD) gypsum as a sustainable alternative to traditional stabilizers for enhancing black cotton soil properties. FGD gypsum, a coal-fired power plant by-product, shows promise for circular economy practices. Lab tests examined its effects on specific gravity, consistency, compaction, unconfined compressive strength (UCS), and California Bearing Ratio (CBR). Mixtures of 90% black cotton (BCS) + 10% FGD gypsum, 80% BCS + 20% FGD gypsum, and 70% BCS + 30% FGD gypsum were tested. Results showed that FGD gypsum decreased liquid and plastic limits, boosting stability. The 20% FGD gypsum mixture, surpassing cement, demonstrated the highest UCS and CBR values. Its calcium content facilitated cementitious compounds, strengthening soil. This research supports FGD gypsum as a promising stabilizer, reducing reliance on costly methods. It promotes sustainable highway construction and aligns with circular economy principles, minimizing environmental impact. FGD gypsum integration can contribute to eco-friendly infrastructure development.

Keywords: Soil Stabilization, Flue Gas Desulfurization (FGD) Gypsum, black cotton soil, Engineering Properties, Sustainable Infrastructure

ISDCP-029

Eco-Engineered Resilience Mitigates Rainfall-Induced Shallow Landslides

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Abstract

Landslides pose significant threats to communities, infrastructure, and the environment, necessitating innovative and sustainable solutions for mitigation. Remote sensing and early warning systems are integral to comprehensive landslide mitigation strategies. However, in recent days promoting environmental harmony is a key theme and these technological approaches have had considerable scientific interest. There are various ecotechnological strategies such as vegetation and soil stabilization, bioengineering techniques, geotextiles, hydroseeding, gabion structures, grassed swales, etc. Integrating These approaches can foster resilience and sustainable development in landslide-prone regions. A classic morphological cause of landslides is erosion. Thus, the present study is focused on leveraging enzyme-based methods to abate erosion for landslide prevention through bio-geotechnical solutions. Specifically, the concept of enzyme-induced calcite precipitation is explored, wherein selected enzymes are employed to enhance soil stability, reduce erosion, and offer sustainable and eco-friendly solutions for landslide mitigation.

Keywords: Ecotechnological solution, enzyme application, landslide, calcite precipitation, slope stability

ISDCP-036

Impact of Intersection Design and Traffic Management on Pedestrian and Vehicle Behavior: A Review

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Abstract

This paper reviews recent studies examining the influence of intersection design on pedestrian safety and vehicle behaviour. The study investigates the impact of refuge island configurations on pedestrian safety perceptions and signal violations at signalized intersections. Key factors such as refuge island geometry, signal timing, and curb side signal head settings were analyzed to understand their effect on pedestrian safety and signal violation behaviours, explored the role of crossing island chicanes in controlling vehicle speed and improving intersection safety. They identified the importance of vehicle path radius and its relationship to pedestrian safety. Additionally, the focus on traffic flow modelling at roundabouts and intersections, assessing the efficiency and resilience of various traffic designs, including traffic signals and roundabouts is also given major importance. emphasizing queuing practices at signalized intersections and proposing non-motor vehicle-friendly designs to enhance traffic safety and efficiency. Collectively, this study highlights the need for more in-depth research on intersection design's influence on pedestrian and vehicle behaviours. The findings suggest that optimizing parameters like refuge island dimensions, signal timing, and incorporating advanced traffic management systems could significantly improve pedestrian and vehicle safety in urban environments.

Keywords: Refuge Islands, Pedestrian Safety, Signal Violations, Intersection Design, Traffic Management, Pedestrian Perception, Chicanes, Roundabouts, Traffic Flow, Non-Motor Vehicles, Signalized Intersections, Vehicle Path Radius, Traffic Efficiency

ISDCP-039

Synergistic Impacts of Carbon Sequestration on the Structural and Environmental Performance of Slag-Stabilized Soils: A Comprehensive Review

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Abstract

The combination of carbon sequestration with slag-stabilized soils is a new way to improve the strength of structures and sustainability in construction, offering exciting possibilities for sustainable advancement. This analysis assesses the unique connection between carbon sequestration mechanisms and soil stabilization through the use of slag-based materials, emphasizing recent progress in utilizing slag's ability to act as a stabilizer as well as a tool for capturing carbon. Fresh research indicates that slag carbonation may result in notable enhancements in mechanical characteristics, resilience, and chemical endurance, while also making significant strides in mitigating carbon dioxide. This paper focuses specifically on the factors that affect the synergy between slag composition, carbonation kinetics, soil types, and environmental conditions. It also offers new perspectives on carbonation mechanisms and their effects on compressive strength, permeability, and chemical durability. The advantages of the environment, like carbon offset capabilities and waste utilization, are evaluated in a

sustainable development context, highlighting the promise of using slag-stabilized soils for infrastructure that can withstand climate change. This review pushes the field forward by tackling current challenges like improving carbonation processes, controlling slag reactivity variability, and ensuring long-term performance. It enhances current understanding, points out important research gaps, and suggests future directions for advancement. In the end, this document provides a thorough grasp of the revolutionary combined impacts of carbon sequestration on slag-stabilized soils, demonstrating its ability to greatly improve sustainable soil management and construction methods.

Keywords: Carbon Sequestration, Slag-Stabilized, Synergistic Impacts

ISDCP-050

Stabilization of Problematic Embankment Black Cotton Soil Using Calcium Chloride as Admixture

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Abstract

This study aims to investigate the potential for stabilizing black cotton soil—a challenging soil type prevalent in many regions—using calcium chloride dihydrate. Black cotton soil is notorious for its high plasticity, low bearing capacity, and its tendency to swell and shrink, which pose significant obstacles in construction. Calcium chloride dihydrate, an inorganic compound created from calcium and chloride, is selected as the stabilizing agent for its availability and environmental advantages. This research will involve comprehensive laboratory testing to examine the effects of calcium chloride dihydrate on the engineering properties of black cotton soil. Various concentrations will be applied in tests including liquid limit, plastic limit, compaction, and unconfined compressive strength, to identify the optimal dosage for improving soil strength, lowering plasticity, and enhancing stability. The study offers a sustainable approach to overcoming construction challenges associated with black cotton soil. Utilizing calcium chloride dihydrate provides an efficient, cost-effective stabilization method that supports sustainable waste management. The findings of this research have the potential to advance soil stabilization practices, delivering a viable and eco-friendly solution for building on black cotton soil.

Keywords: black cotton soil, calcium chloride dehydrate, cost-effective stabilization, sustainable approach, waste management.

ISDCP-064

Utilizing Recycled Glass Powder for Sustainable Stabilization of Laterite Soil in Embankment Protection

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Abstract

Laterite soil, known for its limited load bearing capacity and susceptibility to erosion, poses a significant challenge in civil engineering especially in the case of embankment failures. However, the use of glass powder, specifically of 150-micron size, as an additive enhances the geotechnical properties of the soil.

This aims towards developing a sustainable and cost-effective solution for embankment stabilization. The main objectives of the study are to develop an optimum mix of glass powder to the soil (weight ratio) by analyzing the mechanical properties of the soil-glass powder mixture and to analyze the stability of the soil towards embankment failures. The data for achieving the objectives were collected from the experiments conducted on the soil alone and then later on the soil-glass powder mixture. The experiments conducted were to understand the changes in the Atterberg limits, density achieved through optimum moisture content and the compressive strength. The results and the analysis revealed that the glass powder significantly enhanced the soil mechanical properties offering a stable and effective embankment material. Also, the use of waste glass powder as an additive contributes to sustainable construction practices by recycling glass waste and reducing the reliance on chemical additives promoting environmental conservation. The research can have applications, particularly in regions where laterite soil is common and glass waste is prevalent, for highways, railway embankments, and coastal protections contributing to infrastructure resilience in areas with challenging soil conditions. This study demonstrates that laterite soil stabilized with 150-micron glass powder can be a viable material for embankments, presenting a scalable and eco-friendly alternative for infrastructure projects in tropical and subtropical regions.

Keywords: laterite soil, glass powder, 150-micron size, embankment failures, sustainable construction practices.

ISDCP-065

Wind-Powered Expressway-Design, Analysis, and Prototype Development of Horizontal and Vertical Axis Wind Turbines for Sustainable Energy Harvesting

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Abstract

In recent years, renewable energy sources have surged due to growing concerns about climate change and environmental sustainability. There are several forms of renewable energy, one of which is wind power. Advances in technology have made wind energy more efficient and cost-effective, further boosting its adoption worldwide. As of 2024, wind energy will account for approximately 7% of global electricity generation. By utilizing wind turbines on expressways, we are able to harvest renewable energy consistently and reliably by harnessing the airflow generated by passing vehicles and the wind's velocity. This innovative approach not only contributes to sustainable energy generation but also enhances the efficiency of existing infrastructure. Archimedes wind turbines particularly suitable for environments with variable wind conditions, are an excellent fit for installation along express highways. According to this study, we take into account blade angles of 30, 45 and 60 degrees for designing of horizontal blades using SolidWorks software. We simulate the flow and aerodynamics on turbine blades to improve wind turbine performance. Using a past literature survey, the study also reviews Savonius wind turbines that leverage moving vehicle airflow. Power generated from both sources is then supplied to a nearby charger for EV-Vehicles. This project will result in the development of more efficient and sustainable wind turbines on expressways.

Keywords: Archimedes wind turbine, Savonius wind turbine, CFD Analysis, Expressway, Sustainable energy

ISDCP-070

Effect of Bio-Enzyme on Swell Characteristics of Black Cotton Soil

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Abstract

A better roadway with good geometric elements such as design, condition, and maintenance, is being demanded due to the sharp increase in population. Highway engineers experience challenges providing cost-effective roads since building materials are becoming scarcer these days. This led to the development of new processes and materials using locally accessible materials. Currently, several additives are employed to improve subgrade soil qualities. Hence, the alternate methods and procedures include the stabilizer termed Bio-enzyme. To study the performance of bio-enzyme, one dimensional consolidation test was conducted with different placement conditions- dosages, curing period and water content to study the swell characteristics. SEM and XRD tests are conducted for untreated and treated black cotton soil. From the test results, it was observed that bio-enzyme treated black cotton soil has improved in its swelling characteristics when compared to untreated black cotton soil. SEM results show that addition of bio-enzyme to black cotton soil make it denser. XRD results showed no new substance formation on the addition of bio-enzyme to black cotton soil.

Keywords: Black cotton soil, Oedometer, bio-enzyme, curing

ISDCP-079

Traffic Volume Analysis for Enhancing Urban Roadway Efficiency

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Abstract

Urban roadways face increasing challenges due to rapid urbanization, population growth, and rising vehicular activity, leading to traffic congestion that causes delays, economic losses, environmental degradation, and reduced quality of life. This study, Traffic Volume Analysis for Enhancing Urban Roadway Efficiency, aims to analyze and optimize urban traffic flow to create more effective and sustainable transportation systems. The research involves collecting real-time and historical traffic data from key urban locations, including intersections, arterial roads, and highways, using sources such as traffic cameras, sensors, and GPS-enabled devices. This comprehensive dataset is analyzed using advanced techniques, including statistical modeling, machine learning algorithms, and data visualization, to identify traffic patterns, peak hours, and bottlenecks, providing a detailed understanding of urban traffic dynamics. A significant aspect of the study is the use of predictive analytics to forecast traffic volumes under various scenarios. Machine learning models simulate the impact of interventions like signal timing adjustments, lane reallocations, and new infrastructure development. Additionally, external factors such as weather conditions, public holidays, and special events are considered, ensuring robust and realistic analysis. Environmental considerations, including air pollution levels and carbon emissions, are incorporated to align with sustainability goals. The study also evaluates external factors influencing traffic, such as weather, special events, and public holidays. By accounting for these variables, the analysis ensures a realistic representation of traffic behaviors.

Keywords: Traffic volume analysis, urban transportation systems, predictive, congestion mitigation, sustainable urban planning

ISDCP-082

A Comprehensive Review of Speed Hump Design, Effectiveness, and Optimization Strategies for Traffic Safety

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Abstract

Speed humps are essential infrastructure elements designed to regulate vehicular speeds and enhance safety on roadways. This study provides a detailed review of advancements in the design, functionality, and optimization of speed humps, emphasizing their role in moderating traffic and reducing collision risks. The analysis examines parameters such as geometric configurations, material types, vehicular characteristics, and diverse traffic scenarios. Empirical and simulated evaluations consistently demonstrate that appropriately designed speed humps effectively reduce vehicle speeds while ensuring driver and passenger comfort. Recent developments in technology, such as the application of YOLOv5 models for real-me detection, have enabled their integration with autonomous systems to improve hazard recognition and compliance. However, challenges such as the absence of standardized guidelines and the need for adaptable designs to address varying environmental and operational conditions persist. This review highlights innovative approaches and presents data-driven recommendations for optimizing speed humps, aiming to support sustainable and safe traffic management practices.

Keywords: Speed humps, Traffic calming measures, Geometric design optimization, Road safety engineering, Driver behaviour analysis

ISDCP-102

Digital Dynamic Cone Penetrometer (DCP) for Pavement Evaluation

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Abstract

The Dynamic Cone Penetrometer Test (DCPT) is a critical procedure in transportation and geotechnical engineering, widely used to evaluate soil strength and the structural capacity of pavements. Despite its significance, traditional DCPT methods face several challenges, including limitations in accuracy and efficiency, the necessity of manual data recording, and higher manpower requirements. These factors can contribute to increased costs and potential errors in data collection and interpretation. This study aims to address these limitations by exploring the digitalization of the DCPT using advanced technologies. Specifically, it investigates the integration of ultrasonic sensors with an Arduino Uno microcontroller to create a digital DCPT system. The primary goals are to enhance the accuracy of measurements, improve efficiency, and streamline data collection processes, all while reducing the need

for extensive manual labor. The proposed digital DCPT system automates the process of depth measurement using ultrasonic sensors, which provide real-time data on penetration depth. This data is then displayed and analyzed instantly, offering immediate insights into soil strength and pavement conditions. By automating these measurements, the system minimizes human error and accelerates the data collection process, making it more efficient and reliable. The research methodology involves a comprehensive literature review, detailing the existing challenges and limitations of traditional DCPT methods. This is followed by the development and setup of the hardware, including the ultrasonic sensors and Arduino Uno, and the creation of the software to process and display the collected data. The system is then subjected to rigorous testing to evaluate its performance, accuracy, and reliability compared to traditional methods. Results from the study indicate that the digital DCPT system significantly enhances measurement accuracy and efficiency. The real-time data display allows for prompt analysis and decision-making, which is crucial in field applications. Moreover, the reduction in manual labor and the automation of data recording contribute to cost savings and operational efficiency. Despite the advantages, the study also acknowledges potential challenges in the adoption of digital DCPT systems. These include a slight increase in the initial cost of setup, the need for technical expertise to operate and maintain the system, and potential resistance to change from traditional methods. However, the long-term benefits, such as improved accuracy, efficiency, and cost savings, are expected to outweigh these challenges. In conclusion, the digitalization of the DCPT represents a significant advancement in geotechnical engineering, offering a more accurate, efficient, and cost-effective solution for pavement evaluation. The study's findings highlight the system's potential to transform traditional practices and pave the way for future innovations in the field. Future research should focus on further refining the technology, addressing any remaining challenges, and exploring additional applications in geotechnical assessments.

Keywords: Dynamic Cone Penetrometer Test (DCPT); Pavement evaluation; Digital DCPT; Arduino Uno; Geotechnical investigation; ultrasonic sensor

ISDCP-106

Microscopic Analysis of Four Armed Unsignalized Intersection in an Urban Area to Assess Driver Behaviour and Pedestrian Safety: A Review

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Abstract

A crucial field of study that integrates cutting edge traffic modelling methods with empirical observations to comprehend the dynamics of vehicles and pedestrian interactions is the microscopic analysis of unsignalized intersections. In India, unsignalized intersections are out of control, have a chaotic traffic pattern, and are frequently the scene of accidents. Review includes analysis done on traffic parameters like on speed variations, traffic composition, vehicle speeds, headways, and gap acceptance at unsignalized intersections under varying traffic compositions and conditions. Study driver decision-making, yielding patterns, and pedestrian crossing behaviors for understanding interaction dynamics. To investigate how different types of vehicles (e.g., cars, buses, motorcycles, and non-motorized vehicles) influence intersection performance and capacity.

Keywords: Microscopic Traffic Analysis, Unsignalized intersections, Traffic Simulation Models, Urban Traffic Planning, Artificial Intelligence in Traffic, Real Time Traffic Data

ISDCP-101

Trends and Patterns of Railway Accident in India: A study of the post-Independence Era

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Abstract

This comprehensive study examines the history of railway accidents in India since 1947, with a focus on identifying trends, patterns, and causes of accidents. The research analyzes official data and reports from Indian Railways, government agencies, and other sources to provide a detailed understanding of railway safety in India. The research provides a foundation for understanding the complexities of railway safety in India and informs strategies for improving safety measures, reducing accidents, and enhancing passenger trust.

Keywords: Derailment, Collision, Safety

ISDCP-107

Systematic Literature Review on the Failures of Highways due to Climate Change

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Abstract

Highway infrastructure is increasingly vulnerable to the adverse impacts of climate change, which exacerbates structural failures, operational disruptions, and maintenance challenges. This systematic literature review critically examines existing research on the failures of highways attributed to climate-induced factors, including extreme weather events, thermal stress, precipitation variability, and sea-level rise. Drawing from peer-reviewed studies published between 2000 and 2025, this review categorises highway failures into four key areas: geotechnical, hydrological, structural, and operational. Findings indicate that climate change accelerates pavement deterioration, induces slope failures, compromises drainage systems, and disrupts transportation networks, often resulting in significant economic and societal losses. Emerging solutions, such as using resilient construction materials, predictive modelling technologies, and adaptive design frameworks, are explored as mitigation strategies. Despite advancements, critical research gaps remain, particularly in region-specific risk assessments, long-term infrastructure adaptation planning, and the integration of climate resilience into highway design standards. This review provides a comprehensive synthesis of current knowledge, offering insights for researchers, policymakers, and engineers to enhance highway resilience and sustainability under changing climatic conditions.

Keywords: sustainability, highways, climate change

ISDCP-108

The Impact of Real Time Adaptive Traffic Control System (ATCS) with Vehicle Actuated Control (VAC) on Urban Traffic Congestion: A Systematic Review

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Abstract

Urbanization and exponential vehicular growth have led to significant traffic congestion and environmental challenges in metropolitan areas. Adaptive Traffic Signal Control Systems (ATSC), enhanced by Vehicle Actuated Control (VAC) and connected vehicle technologies, offer promising solutions to mitigate these issues. This review explores the current advancements and challenges in implementing ATSC systems, focusing on single and multi-intersection designs. Emphasis is placed on techniques like Reinforcement Learning (RL), Fuzzy Logic (FL), and Metaheuristic algorithms, highlighting their roles in real-time traffic optimization. Additionally, the integration of environmental objectives through decarbonization strategies is examined. Findings reveal substantial reductions in congestion, delays, and emissions using these intelligent systems, though scalability and multi-agent coordination remain areas for future research. This work aims to guide researchers and policymakers in developing next-generation ATSC systems that balance operational efficiency, environmental sustainability, and economic viability.

Keywords: Adaptive Traffic Signal Control, Vehicle Actuated Control, Intelligent Transportation Systems, Reinforcement Learning, Decarbonization, Multi-Intersection Optimization.

ISDCP-109

A Review on Experimental Investigation of Stabilization of Black Cotton and Lateritic Soil Using Industrial Wastes as an Alternative for Cement in Pavement Construction

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Abstract

The stabilization of expansive soils, such as black cotton and lateritic soils, is essential in pavement construction due to their low bearing capacity and high plasticity. Traditional stabilizers like cement and lime incur significant environmental and economic costs. This study investigates industrial by-products such as quarry dust, fly ash, GGBS, and red mud as sustainable alternatives for soil stabilization. Laboratory tests, including Atterberg limits, unconfined compressive strength (UCS), and California bearing ratio (CBR), show substantial improvements in soil strength, reduced plasticity, and enhanced load-bearing capacity. Quarry dust and red mud reduce swelling potential, while GGBS with lime facilitates pozzolanic reactions. Recycled materials like copper slag improve CBR, making treated soils suitable for pavement applications. This approach minimizes waste disposal issues, reduces greenhouse gas emissions, and conserves natural resources. Results confirm that industrial by-products can effectively stabilize problematic soils, offering sustainable and cost-effective construction solutions. Future studies should explore long-term and combined waste effects.

Keywords: Soil Stabilization, Black Cotton Soil, Lateritic Soil, Industrial Wastes, Quarry Dust, Fly Ash, GGBS, Red Mud, Copper Slag, CBR, UCS, Sustainable Construction.

ISDCP-110

Investigation on Marshall Characteristics of Bituminous Mixes with Utilization of Areca Fiber and Stone Dust as Filler Material

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Abstract

This research examines the use of areca husk and its fiber in the construction of roads. Areca husk is an entirely new waste material that is used in the transportation sector. In general, past research has shown that adding fiber enhances the engineering properties of asphalt mixes when combined with modified bitumen. It is an undeniable fact that typical bituminous blends become obsolete under severe loading circumstances and variations in the climate. The current study examines the features of SMA Mix and influence of fiber addition. The study's objectives were to achieve the desired gradation as specified by IRC: SP: 79: 2023 by using locally available aggregates and other materials, as well as determining the optimal binder and fiber composition by varying binder content by 5.8%, 6%, 6.2%, 6.4%, and 6.6% by total weight of aggregates under Marshall method. In this research, binder is VG-40 grade the filler is stone dust, and the fiber is areca husk. The results revealed that the mix of SMA with OBC and fiber has better resistance than the conventional SMA.

Keywords: Areca-fiber, Areca Husk, Stone matrix asphalt (SMA), optimal binder content, fiber composition

ISDCP-111

Eco-Friendly Geopolymer Paver Blocks Using Recycled Aggregates for Light Traffic Roads

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Abstract

This study investigates the development of sustainable paver blocks designed for roads with light traffic (<0.5 MSA) using fly ash geopolymer concrete (GPC). The approach involves the complete replacement of conventional aggregate materials by recycled materials sourced from Construction & Demolition waste, promoting environmental sustainability. The F Class fly-ash is utilized as the main binder, entirely replacing cement, & the geo-polymerization process is triggered by employing a solution of alkaline comprising solution of sodium hydroxide & sodium silicate gels. Sodium hydroxide solutions with varying molarities (11M, 12M, 13M, and 14M) were adopted to optimize the GPC mix. Here, the mix design was prepared by following conventional concrete design principles. Specimens were cast and permitted to set at normal room temperature over 24 hours, thereafter by laboratory oven curing at 60°C for another 24hours. Mechanical tests, including compression, flexural, splitting tensile strengths, and durability tests were performed as per IS standards. The results demonstrated that, the fly ash geopolymer paver blocks displayed superior mechanical properties, making them suitable for applications in roads with light traffic. These blocks offer an eco-friendly and sustainable by promoting waste recycling and reducing carbon emission.

Keywords: Recycled aggregates, Geopolymer concrete, Light traffic roads, Construction and demolition waste, Alkaline liquids

ISDCP-120

Analysis, Design and Simulation of Vehicle to Vehicle Integrated Bus Stop Zone Under Different Scenarios

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Abstract

Urban areas depend on buses for smooth population movement, alleviating traffic congestion. While promoting public transport is vital, incidents like manoeuvres at curb side stops and bus bays worsen traffic issues. In large cities, the surge of vehicles at bus stops during peak hours leads to queues, causing time loss and congestion. Understanding these queue dynamics is essential for improving bus stop efficiency and minimizing the negative impact on traffic flow. To analyse these issues, few traffic engineering surveys were employed. The study encompassed a simple delay assessment using the license plate method, providing quantitative data on the time vehicles spent at bus stops. A video graphic survey was conducted to visually capture and analyse traffic dynamics, offering insights into the operational challenges faced by buses. Traffic volume counts were performed at different Levels of Service (LOS) to assess the impact of bus-related incidents on overall traffic flow. This approach facilitated a comprehensive understanding of the complexities associated with bus-related delays and congestion. In order to tackle this issues, present study proposes a Smart Bus Alert System as a pioneering solution that combines innovative technical skills with essential safety services for urban transportation. The system utilizes GPS Tracking to precisely determine the bus's distance from the stop. Three LEDs activate progressively at 300, 200, and 100 meters, providing early warning, closer proximity, and signalling imminent arrival. This progressive activation offers clear visual indications to surrounding vehicles, enhancing safety and facilitating appropriate manoeuvring. In addition to its technical capabilities, the system features a manual override near the driver's seat, allowing drivers to operate LED indicators during emergencies. This ensures flexibility and responsiveness, promoting immediate communication with surrounding vehicles and prioritizing safety, particularly in the absence of exclusive bus lanes and bays in urban areas. While in the process of conducting a simulation study on the above topic, the anticipated outcome is an enhanced understanding of the Smart Bus Alert System's impact on traffic flow, safety, and overall urban transportation efficiency. In conclusion, simulation with PTV Vissim has proved to reduce the 50% delay time.

Keywords: License plate method, LOS, Smart Bus Alert System, GPS and Simulation

ISDCP-151

Sustainable Management for Emerging Metropolises: The Bangalore Case Traffic

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Abstract

Bangalore, the premier IT city in India, is experiencing increasing traffic congestion due to population expansion, urbanization, and an exponential increase in car usage. This paper investigates environmentally friendly traffic control strategies adapted to the city's particular urban environment. Initiatives for Non-Motorized Transportation (NMT), improved public transportation, and Intelligent Transportation Systems (ITS) are important tactics. The study assesses the efficacy of Traffic Demand

Management (TDM) strategies such as better infrastructure planning, staggered work schedules, and congestion pricing. Case studies demonstrate how well they worked in similar urban areas and how they could be modified for Bangalore. To promote a sustainable urban mobility environment, the study emphasizes the significance of adopting green technologies, integrating policies, and collaborating with stakeholders. The suggestions are intended to alleviate traffic jams, lower carbon emissions, and improve Bangalore inhabitants' quality of life while acting as a template for other developing metropolises.

Keywords: Urban Challenges, Sustainability, Strategic Solution.

ISDCP-123

Laboratory Evaluation of Bituminous Mixture Using Wet-bond as Warm Mix Additive

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Abstract

The project explores the essential role of bituminous mixtures in road construction, highlighting their significance due to their adaptability and long-lasting performance. However, conventional bituminous mixtures incur high energy consumption and environmental emissions during production and compaction. In response, the study advocates for exploring alternative Warm Mix Asphalt (WMA) technologies to alleviate these concerns. WETBOND, identified as a renewable and eco-friendly by product, emerges as a promising warm admixture for bituminous mixtures. While some studies have investigated WETBOND in asphalt binders, a comprehensive understanding of its potential as a WMA additive in bituminous mixtures remains limited, prompting the need for thorough research. This project aims to assess the effectiveness of WETBOND as a warm admixture in bituminous mixtures through a series of laboratory tests and field evaluations. The primary objectives include determining the optimal WETBOND content, evaluating its impact on mix workability and long-term performance, and quantifying potential reductions in energy consumption and emissions. The study seeks to address critical knowledge gaps, providing insights into WETBOND's suitability as a warm admixture by considering its influence on mechanical properties and environmental advantages. Through these investigations, the research aims to contribute valuable information for a sustainable and energy-efficient approach to road construction, ultimately working towards mitigating the environmental footprint of the industry.

Keywords: Warm Mix Asphalt (WMA) Technologies, WETBOND, Sustainable Road Construction

TRACK 3 - STRUCTURES AND MATERIAL SCIENCE

ISDCP-001

Prediction of Compressive Strength of Fly Ash Based Geopolymer Concrete Using Support Vector Regression

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Abstract

The use of Portland cement in concrete construction is under critical review due to high amount of carbon dioxide gas released to the atmosphere during the production of cement. Geopolymer concrete synthesized from aluminosilicate sources reutilizes the industrial wastes and reduces the greenhouse gases, offers a very good sustainable alternative to Portland cement. Fly ash based geopolymer concrete (FABGPC) is gaining popularity in the construction industry due to the several sustainability benefits enfolding its utilization. Therefore, FABGPC seems to be a superlative option over the conventional concrete, to be developed. In this study a support vector regression (SVR), a machine learning algorithm, has been applied to predict the 7- and 28-days compressive strength of FABGPC. The SVR model was trained and tested on a total of 189 concrete samples retrieved from comprehensive literature survey. The performance of the model was evaluated using linear correlation coefficient (R), root mean squared error (RMSE), mean absolute error (MAE) and mean absolute percentage error (MAPE). The obtained statistical values demonstrate that the proposed SVR model can be a reliable method for the prediction of compressive strength of FABGPC in concrete industry.

Keywords: Geopolymer concrete, Fly ash, Compressive strength, Support vector regression

ISDCP-002

Harnessing Olivine Sand for Sustainable Concrete: Enhancing Strength and Durability through Cement and Aggregate Replacement

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Abstract

Concrete, the second most consumed material globally after water, is vital in construction, the world's fastest-growing sector. However, cement, a primary component of concrete, is highly energy-intensive to produce, contributing significantly to carbon emissions. This study explores the potential of olivine sand, the most abundant mineral in the Earth's upper mantle and a main component of the basalt rocks that form the oceanic crust, as a sustainable alternative by partially replacing cement and fine aggregates in concrete. In the first phase, cement was replaced by 30% olivine sand, leveraging its 35–40% silica content to enhance strength. Compressive and split tensile strength tests showed notable improvement in mechanical properties. In the second phase, fine aggregates were entirely replaced with olivine sand, a byproduct with particle sizes compliant with IS zones 1, 2, and 3. Steel fibers (5%) were added to further enhance tensile strength. Results revealed significant improvements in compressive strength, tensile strength, and durability, underscoring olivine sand's efficacy as an eco-friendly material in concrete production. This dual approach not only reduces the environmental impact of cement production but also addresses waste utilization, making it a viable solution for sustainable construction.

Keywords: Sustainable Construction, Olivine Sand, Cement Replacement, Mechanical Properties, Carbon Emissions Reduction

ISDCP-004

Forecasting of Mechanical Properties of Banana Fibre Reinforced Concrete Using Artificial Neural Network

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Abstract

In the present study the mechanical properties of banana fiber reinforced particulate composite is predicted by using ANN approach. The experimental study by using short banana fibers reinforced with flyash as an additive to cement and Super AURMAX 200 chemical admixture is used in this study. Experiments conducted as per IS standards, and results of compressive and split tensile strengths are reported. It is also reported that the fiber length is having a significant effect on the properties of particulate composites. The traditional experimental methods used in obtaining the properties of composites are expensive, require human resources, time consuming and human errors may occur. To reduce the above drawbacks, the present study is undertaken to develop a weighted matrix between input and output properties.The parameters considered for the ANN inputs are FA/C, CA/C, W/C, Fly ash/C, Super Plasticizer/C, length, diameter, percentage of fiber added. The results from training and testing models have shown the great potential of ANN in predicting the compressive and split tensile strengths of banana fiber reinforced concrete.

Keywords: Banana fiber reinforced concrete. Fly ash, Artificial neural network (ANN), Strength Prediction

ISDCP-005

Effect of Partial Binder Replacement on the Properties of Cement based Concrete Mixes Incorporating Industrial Wastes as Aggregates

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Abstract

Construction industry is progressively seeking sustainable approaches to reduce its environmental footprint. Choice of construction materials, their usage, optimisation approaches and end-of-cycle strategy assist in achieving the sustainability goal without compromising the strength requirements and economic feasibility. The exploration and use of supplementary cementitious materials (SCM) as an effective partial substitute to ordinary Portland cement (OPC) has been an enduring quest in concrete production. The present study investigates this aspect of partial replacement of OPC with Ground Granulated Blast Furnace Slag (GGBS). Along with the binder replacement the attempt is to replace the conventional aggregates as well-natural fine aggregate (NFA) and natural coarse aggregate (NCA) - with industrial by-products. Un-processed Pond Ash (PA) as a NFA replacement and Recycled Coarse Aggregate (RCA) as a NCA replacement has been explored. The objective of the study is to obtain a concrete mix of nominal grade M25 through incorporation of the above said alternative materials. To assess the efficacy of the substitution 22 concrete mixes are prepared through various combination of partial replacement with alternative materials at substitution rates of 20%, 40% and 60%. Concrete cubes are tested as per IS:516-1959 after 7 days and 28 days of curing for compressive strength and the test results are compared with the control mix. The results of the experimental investigation are

discussed in detail and it can be noted that the replacement of binder and aggregates at 20% each provides the best strength requirements as compared to other mixes. The investigation has been further carried out through Scanning electron microscopy (SEM) and Energy dispersive X-ray spectroscopy (EDAX) analysis, were the microstructural and mineralogical characteristics of concrete mixes satisfying the strength requirements at 28 days have been studied. In addition, the embodied energy of these mixes is computed to account for their environmental benefits.

Keywords: material replacement, sustainability, GGBS, Pond ash, recycled coarse aggregates, embodied energy, alternative materials.

ISDCP-007

Compressive Strength Prediction of SCC using ANN

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Abstract

Infrastructure is the driving force for the economic growth of any country. Industries play a vital role in building up the infrastructure. Concrete is one among the products produced in larger extent and nowadays it has become the integral part of the building because of its wide range of characteristics which satisfies both strength and durability requirements. Keeping in view of environmental concerns, management of Industrial waste in nowadays is a challenging task as it turns out be a serious threat. Being a part of Green Initiative, Industrial wastes such as GGBS, Fly ash, Silica fume, Metakaolin and RHA can be effectively utilized as replacement for OPC as it posses pozzolanic properties which minimizes the carbon footprint occurs due to cement production. Strength of concrete inherits on the compaction characteristics and workability matters the most. To overcome these challenges, Self-compacting concrete (SCC) is widely used in the construction which flows and gets consolidated on its own weight which speeds up the construction rate and thereby reduces the dependency on labour. Assessing the compressive strength is the vital factor in construction sector which requires certain period of time to get the results due to curing periods. In view the reducing the efforts for the construction industry, a new tool named ANN can be used to get the desired results of the concrete even without being casted. Present work emphasis on strength prediction of SCC using ANN by considering the influence of concrete ingredients and controlling factors. The Experimental Data set is Collected from Peer Reviewed Journals for developing the model. Pearson's Correlation Co-efficient of 0.9846, MAPE of 7.08 & Mean Squared Error of 0.0011625 was achieved.

Keywords: Self-compacting concrete, Compressive Strength, Durability

ISDCP-009

Seismic Response of Cooling Towers for Fixed Base and Column Supports

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Abstract

Hyperbolic Cooling towers are iconic structures used in industrial settings for heat dissipation through evaporative cooling. Their distinctive shape, characterized by a hyperboloid structure, enhances air flow efficiency, and ensured effective thermal regulation. Its preferred hyperbolic shape ensures strength, stability, and ample base area, optimizing operational effectiveness. In the present work, study on free vibration, static and seismic analysis is carried out to understand the behaviour of the structure. Two different boundary conditions are considered for the analysis namely shell on fixed base and A-type column supports. The response of the structure in terms of natural frequency, mode shapes and hoop force, meridional force are observed. FEM based ANSYS software is used for analysis. Different modes of vibration are observed for both boundary conditions. The response of cooling tower shell in terms of hoop force and meridional force for gravity loads is observed. Response spectrum analysis is carried out for 0.5g ground acceleration for shell on fixed base and A type column supports, the variation of hoop forces and meridional forces along the height of the structure is observed and the same is plotted in graphical representation. It is found that natural frequencies of shell on fixed base varied 10-15% in initial modes and 50-60% at higher modes compared to column supported cooling tower shell. The reduction in natural frequency in column supported shell is observed because of provision of column; due to flexibility of the columns the reduction in frequency is observed. There is no significant variation in meridional forces for shell on fixed base and column supports, whereas the hoop forces are significantly affected around 25% at vicinity of the shell-column junction. The hoop and meridional forces are largely affected at bottom of shell for both fixed base and column supported cooling tower due to seismic action.

Keywords: Seismic, Cooling tower, Shell, Column supports

ISDCP-014

Influence of Flax Fiber as Additional Material on Strength of Concrete

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Abstract

In the ever-evolving field of construction materials, the demand for eco-friendly solutions continues to grow. Various type of synthetic and natural fibers has been used as concrete materials. Natural fiber is widely available and inexpensive source in accelerating the strength of concrete. This paper presents the experimental results of an optimized flax fiber reinforced concrete promoting sustainable and eco-friendly building practices. Flax fiber in varying percentage is used along with M20 grade concrete mix as additional material, the compression strength is analysed at the age of 3 days, 7 days and 28days. The results addition of 2% Flax fibers shows the optimum compression strength of 30.03 N/mm2 at the age 28 days.

Keywords: Flax fiber, Compression Strength, Reinforcement, Age in days

ISDCP-015

An Empirical & Analytical Study on Composite RC Beams with Bentonite Clay and Wheat Straw Ash as Partial Substitutes in Cement

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Abstract

The project investigates composite reinforced concrete (RC) beams using standardized ISMB 150 mm sections with a concrete grade of M25. A crucial aspect of the study is examining the behaviour of the composite RC beams under the influence of additives such as Bentonite clay and wheat straw ash, while maintaining the M25 grade constant. Bentonite is a natural pozzolanic material with cementitious properties that can be used as a partial replacement for cement at equal intervals, whereas wheat straw ash is an agricultural product that is burned into ash which is a good material that meets the physical characteristics and chemical composition of material admixtures. The empirical phase of the project involves experiments on both composite and conventional RC beams, focusing on flexural and compressive strength characteristics. In the analytical phase, finite element modelling using ETABS software is employed to simulate and predict the structural behaviour of both composite and RC beams. The deflection values obtained from the calculated failure loads are validated through ETABS modelling. Additionally, this project utilizes empirical formulas from ACI 318-19 (American Concrete Institute) to establish the relationship between flexural and compressive strength. This framework enhances the project by providing a theoretical basis for analysing experimental results.

ISDCP-017

Examining the Properties of Concrete with Implementation of Bentonite Clay and Wheat Straw Ash as Partial Substitutes in Cement

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Abstract

The research work has been done on using bentonite clay and wheat straw ash as partial substitution in cement. In order to maximize the compressive strength of concrete, this research project entails an experimental investigation of locally accessible wheat straw ash and bentonite clay as partial replacements for cement. An agricultural product made by burning wheat straw to ash is called wheat straw ash. It is determined to be a good material that satisfies the chemical composition and physical requirements of material admixtures. Even at the ages of three and seven days, wheat straw ash cements that included up to a certain proportion of cement by weight had compressive strengths that were noticeably greater than the normal cement. Bentonite is natural pozzolanic material have cementitious properties and help to reduce greenhouse gas emission and gives more durability in the concrete structure. Bentonite creates perfection in pore structure of concrete mix and the ability to resist sulfuric acid attacks. This research investigates that the partial replacements of wheat straw ash and bentonite clay by weight of cement with varying proportions of 0 %, 5 %, 10 %, 15 % and 20 % and cured for 7,14 and 28 days. These specimens were tested for the compressive strength for 7, 14 and 28 days and split tensile strength tests were conducted for 7 and 28 days. Both the tests' results indicates that there is an increase in compressive and split tensile strength when compared with the controlled concrete.

ISDCP-019

Effectiveness of Hybrid Fibres for Enhancing the Bond Capacity between Sand Coated GFRP Rebar and Concrete

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Abstract

Glass Fiber Reinforced Polymer (GFRP) bars are emerging as a viable alternative to steel reinforcement in concrete structures due to their superior tensile strength. However, the bond between GFRP bars and concrete is a critical factor in the design of reinforced cement concrete (RCC) structures. This study investigates the bond performance of GFRP bars, both with and without sand coatings, when embedded in concrete cubes (0.2×0.2×0.2 m) reinforced with hybrid fibers. The hybrid fibers, comprising 0.35%, 0.7%, and 1% by volume of hooked-end steel fibers and polypropylene (PP) macro synthetic fibers, were incorporated to enhance the bond strength. The bond strength was evaluated using the pull-out test as per IS 2770 Part 1-1967. Despite the absence of specific Indian standards for GFRP bars, their use is guided by international codes such as ACI 440.11, ACI 440.1R-15, and ACI 440.2R. The results indicate that the inclusion of hybrid fibers significantly improves the bond stress between GFRP bars and concrete. This improvement is attributed to the enhanced interlocking mechanism provided by the fibers, which effectively resists the pull-out forces. The study concludes that the use of hybrid fibers in fiber-reinforced concrete (FRC) with GFRP reinforcement not only increases bond capacity but also enhances confinement. This research provides valuable insights into the bond performance of GFRP rebars utilizing short discrete macro hybrid fibers, highlighting their potential to improve the structural integrity and durability of RCC structures.

Keywords: Hybrid fibres; Hooked end steel fibres; Macro synthetic fibres

ISDCP-022

Evaluation of Flexural Behavior of GFRP-Reinforced Concrete Beams with Coconut Fiber Reinforcement

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Abstract

GFRP has become a popular choice for reinforcing concrete beams due to its high strength-to-weight ratio, corrosion resistance, and ease of handling, making it an efficient and practical reinforcement material. Natural fibers, such as coconut fibers, have also gained attention as a potential reinforcement for concrete. Coconut fibers are biodegradable, non-toxic, and possess mechanical properties in terms of strength and durability. When incorporated into concrete, coconut fibers can enhance the mechanical performance by preventing crack formation, similar to synthetic fibers. In this study, the beam specimens were prepared with GFRP reinforcement and coconut fibers, steel reinforcement without coconut fibre, GFRP reinforcement and coconut fiber and compression specimens were prepared with coconut fibre, by varying coconut fiber dosage of 1%, 2%, 3% and 4% by weight of cement and subjected to standard curing conditions. Concrete beams reinforced with GFRP rebars exhibit lower flexural strength compared to those with steel reinforcement. The optimum dosage of 2% coconut fibres

with GFRP reinforced beams achieves the higher flexural strength compare to steel reinforced beams and with dosage of 1% gives maximum compression strength. The use of the optimal coconut fiber dosage in GFRP reinforcement not only enhances the mechanical performance of concrete beams but also results in a decrease in the overall weight of the beams and coconut fibers enhance crack resistance, improve flexural strength, and contribute to the overall durability of concrete structures. This highlights the potential of GFRP and coconut fibres as a promising sustainable alternative in construction applications.

Keywords: Glass Fibre Reinforced Polymer, Flexural strength, compression specimen, Coconut fibres.

ISDCP-026

Response Spectrum Analysis of Multi-Span Bridge: Retrofitting by Steel Jacketing

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Abstract

Bridges are vital infrastructure, ensuring connectivity and the smooth movement of goods and people. However, in earthquake-prone regions, their susceptibility to seismic activity is a major concern. During seismic events, bridges can undergo severe lateral and vertical displacements which, if inadequately managed, can lead to structural damage, operational disruptions, and even catastrophic failures. The seismic response of a bridge is significantly influenced by both its structural components and the characteristics of the surrounding soil. The interaction between the bridge's substructure and the ground is pivotal in determining its seismic resilience. Soil-structure interaction (SSI) significantly influences a bridge's seismic response, as the soil's properties and the structure's characteristics interact during earthquakes. This interaction can amplify or mitigate the seismic forces experienced by the bridge. Given the uncertainties in the interplay between ground motion, soil, and structural characteristics, fragility analysis is commonly employed to assess seismic performance. Seismic fragility curves are essential tools for assessing a bridge's vulnerability. They provide probabilistic estimates of damage or collapse under various ground motion intensities. Response spectrum analysis (RSA) is a powerful tool used in structural engineering to assess the seismic performance of bridges. It allows to evaluate the potential damage of a structure under various earthquake intensities without performing time-consuming nonlinear time history analysis. Fragility curves are probabilistic models that represent the likelihood of a structure reaching a specific damage state at a given level of ground motion intensity. By analysing fragility curves, one can identify weak points and prioritize retrofitting measures to improve a bridge's seismic resilience. By combining RSA with fragility curves, on can estimate the seismic risk of bridges and make informed decisions about seismic retrofitting or replacement. Steel jacketing is a widely used technique to enhance the seismic performance of existing reinforced concrete (RC) bridge columns. This method involves encasing the existing column with a steel shell or jacket, which significantly improves its strength and ductility.

Keywords: Soil-Structure Interaction (SSI), Fragility curves, Seismic isolation, Response Spectrum Analysis, Steel Jacketing.

ISDCP-027

Time History Analysis and Retrofitting of RCT- Beam Bridge Structure

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Abstract

In today's transportation networks, bridges are essential because they provide quick access to a variety of locations. Notwithstanding their significance, these structures have flaws that could cause serious harm, particularly in the event of a seismic disaster. A country's bridge infrastructure has a major impact on its economic health. But a lot of older bridges built before 1970 are showing signs of deterioration that are being made worse by things like climate change. Seismic design guidelines did not include the thorough advice required to guarantee strength and resilience when they were first constructed. Because of this, existing bridges frequently fail to meet requirements for structural integrity and capacity, underscoring the urgent need for improvements and retrofitting to improve their longevity and safety in the ever- changing environmental circumstances of today. If seismic forces are not adequately reduced, bridges may experience major lateral movements and ground motions that could result in structural damage, service interruptions, and even catastrophic events. A structure's response dynamics during strong seismic events are largely determined by the behavior and properties of the surrounding soil in addition to the structure's superstructure. Even though the bridge piers did not collapse, many experienced significant residual deformations during the earthquakes. This could make the bridges unusable, necessitating extensive repairs or possibly even complete replacement. A static pushover analysis is also conducted to assess the bridges' vulnerability to lateral spreading caused by liquefaction. Dynamic analysis like Time History Analysis is conducted to analyse the bridge. Fragility curves provide the probability that a structure or its components will attain a specific level of damage given a particular intensity measure of ground motion. Bearings are commonly employed as seismic isolators for bridges due to their excellent performance and broad applicability.

Keywords: Seismic Response, Bridge Structures, Fragility Curves, Seismic Isolators, Time

History Analysis.

ISDCP-028

Study on Performance Evaluation of Ultra High-Performance Concrete

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Abstract

This study investigates the effects of different curing regimes on the development of Ultra high-performance concrete (UHPC), focusing on hydration kinetics, compressive strength, and durability characteristics. The development of UHPC has garnered significant interest due to its superior mechanical properties, durability, and versatility in modern construction. However, achieving the desired performance requires precise control over the curing process, as curing regimes directly impact the microstructure and overall properties of the material. Mixes were produced using fine aggregates, silica fume, superplasticizer, and low water-to-binder ratio with variation of curing regimes. Accelerated curing compared to traditional ambient curing and steam curing for a range of temperatures and humidity conditions. The study is on the monitoring of early-age strength development, long-term mechanical performance, shrinkage, and resistance against chloride ion penetration. Results showed

that accelerated curing methods significantly improve early- age strength, whereas steam curing produces more refined microstructure, improving durability attributes such as cracking and chloride ingress resistance. However, for ambient curing, the best long-term mechanical performance was obtained, which may indicate an inherent trade- off between early strength gain and long-term durability depending on the curing regime. Insights into the best curing strategies for UHPC and guide practice towards achieving both adequate early strength and satisfactory long-term durability, which are essences in high-performance construction applications.

ISDCP-031

Use of RAP and Egg Shell Powder in Self-Compacting Concrete

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Abstract

This project explores the use of recycled asphalt pavement (RAP) and Egg shell powder as partial replacements in self-compacting concrete (SCC) to improve both its performance and sustainability. We focused on assessing the mechanical properties of SCC by conducting tests for flexural strength, split tensile strength, and compressive strength. Different proportions of RAP and Egg shell powder were mixed into the concrete, and we carefully analyzed how these materials affected the key properties. Our findings reveal that some mixtures show enhanced flexural and split tensile strengths while still achieving satisfactory compressive strength. This suggests that incorporating RAP and Egg shell powder can positively impact the performance of SCC. Overall, this research demonstrates the potential for using waste materials in concrete production, supporting eco-friendly practices in the construction industry and aiding waste reduction. In the compression strength on the 28th day we got CM as highest strength of 35.38. In split tensile test we got highest strength of CM of 4.46 on the 28th day. In Flexer Strength we got RAP60+16 as highest strength of 6.75 on the 28th day. We use Egg Shell powder as a cementitious material. The rap material was sieved before use Only 10MM down and 1 2.5 mm retained sieve sized wrap was considered.

Keywords: Reclaimed asphalt pavement, Self-compacting concrete, Eggshell powder, Compression test, Flexure test, Split tensile test

ISDCP-040

A Study on Strength and Durability of UHPC containing Hybrid Fibre Composite

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Abstract

The study is on use of ultra-high-performance concrete (UHPC) in particular in terms of strengthening and improving durability through fibre. The high strength and high resistance to environmental degradation besides high tensile strain at failure grant ultra-high performance concrete a huge potential for sustainable construction. It provides a global acceptance of ultra-high-performance concrete and its development based on providing its production in bridges, building parts, and several industrial applications. Studies using fibre influence on UHPC's compressive, tensile, and flexural properties. Contributions of various fibre types and combinations in the resistance to cracking, stiffness, and toughness are recommended to enhance UHPC significantly with the optimal reinforcement, and

the study also report presence of Ground granulated blast furnace slag (GGBS) and ultra- fine slag in the concrete mixture. A broad range of mechanical tests and a materials selection process accompanied by microscopic analysis characterized the experimental methodology. UHPC provides sustainable solutions to highly conditioned infrastructure, thus extending the lifespan of the structure and reducing the maintenance period over time.

Keywords: UHPC, GGBS, fibers, sustainable construction

ISDCP-042

Analysis of Building with various Loading Condition of Wind and Earthquake

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Abstract

The design of buildings under various loading conditions is a critical aspect of structural engineering, ensuring the safety, functionality, and durability of structures. This study focuses on the comprehensive analysis and design of buildings subjected to different types of loads, including dead loads, live loads, wind loads, earthquake loads, and thermal effects. A detailed methodology was developed using advanced modeling techniques and software tools to analyze structural behavior under these dynamic and static forces. Special emphasis was placed on considering localized building codes and standards, such as IS 875, IS 456, and IS 1893, to ensure compliance and safety. The research highlights the role of material properties, geometric configurations, and load distribution patterns in achieving optimal structural performance. Various design scenarios were explored to address challenges such as lateral stability, deflection control, and load path redundancy. Innovative techniques, such as performance-based design and load-resisting systems, were incorporated to enhance the building's resilience against extreme conditions. The results demonstrate the effectiveness of integrating advanced computational tools with practical engineering principles in achieving cost-effective and sustainable designs. This study contributes valuable insights into optimizing building design under diverse loading conditions, ensuring safety, efficiency, and longevity.

Keywords: Tall Buildings, Wind Load, Seismic Load, ETABS

ISDCP-045

Laboratory Evaluation of Asphalt Mixtures Modified with Sugarcane Molases

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Abstract

One particular area of concern is the environmental impact of the hot asphalt industry, which uses a large amount of energy and materials to construct roads. Molasses production is influenced by several factors, including the amount of sugar used, how it was extracted, and how old the plant was. This study is looking at how well molasses from sugarcane waste can be used to modify asphalt binders, and then assessing the performance of these mixes in terms of quality, durability and moisture resistance. This was done by measuring how well the base binder and the asphalt concrete mixture performed in response to four different amounts of sugarcane waste molasses: 5%, 10%, 15%, and 20% by asphalt

weight. Furthermore, using tests like indirect tensile strength (ITS), Marshall stability ratio (MSR) and Ultrasonic pulse velocity (UPV) tests, the mechanical properties of the modified sugarcane molasses binder in asphalt concrete mixes were evaluated. the tensile strength value reduces when asphalt binder replaces sugarcane molasses by 20%. the modified binder with 10% of molasses in it was found to have the highest tensile strength ratio. The properties of the asphalt specimens, including load and flow rates and moisture damage resistance, may be improved with the use of this modified binder.

Keywords: Sugarcane Molasses, indirect tensile strength (ITS), Marshall stability ratio (MSR) and Ultrasonic pulse velocity (UPV)

ISDCP-046

A Review on Self-Curing Agents Applied to Self-Compacting Concrete

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Abstract

Self-cured concrete is better than conventional concrete because it shows better water retaining capacity, when compared to conventional concrete. During the hydration process internal curing agent is added so that water retained will be released slowly. The different research studies about self-curing concrete with different materials like superabsorbent polymers (SAP), Natural fibers, and Artificial lightweight aggregate (LWA) are discussed. The mechanisms of curing agents like artificial normal-weight aggregates and physical and mechanical properties are reviewed in this study. Durability, Shrinkage, Cracking susceptibility behavior were the effects seen by adopting the self-curing concrete. The permeability is also reduced. Curing techniques and curing duration significantly affect curing efficiency. The efficiency of self-curing concrete is evaluated by means of SEM (Scanning electron microscope) in which hydration and microstructures behavior is taken into consideration.

Keywords: lightweight aggregate, Scanning electron microscope, Durability

ISDCP-047

Enhancing Normal Concrete Properties using Natural Rubber Latex: A Sustainable Approach

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Abstract

Concrete is frequently required for large-scale infrastructure projects due to its exceptional flexural strength, toughness, abrasion resistance, and durability. Concrete structures can have their flexural strength and usability improved with polymer-modified concrete. This research looks at the possibility of using natural polymer Natural Rubber Latex (NRL) instead of synthetic latex to improve concrete's performance qualities. Incorporating a dry rubber content ranging from 0.5% to 2% by weight of cement into the mixture composition, natural rubber latex is incorporated into concrete. Binder content containing 20% flyash has been the subject of studies. The article compares latex-modified concrete to other types of fiber-reinforced concrete, including basalt and polypropylene, as well as the hybrid effect

of latex and fiber in concrete. By combining NRL with fiber, the results show that concrete's flexural strength can be improved by 35% to 45%. The addition of natural rubber latex can increase the energy absorption capacity by as much as 231% as a result of reduced wear and impact loading. Highly long-lasting concrete is latex-modified concrete, which has reduced chloride ion permeability and water absorption. The NRL modified concrete showed promise as a solution for structures in aggressive environments and pavement construction, as confirmed by microstructure investigation, which indicated a dense matrix. Factory floors, bridge decks, machine foundations, and structures in seismic zones can all benefit from NRL modified concrete's improved mechanical characteristics, which include flexural strength, impact resistance, and abrasion resistance.

Keywords: Natural rubber latex, compressive strength, machine learning

ISDCP-048

Experimental Studies on Basalt Fiber Reinforced Concrete Beams

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Abstract

This paper deals with the flexural behaviour study on reinforced concrete beams with conventional steel and basalt rebars. Conventional steel bars are vulnerable to various environmental attacks and aggressive attacks such as corrosion. Basalt rebar can effectively overcome this problem due to its enhanced properties like corrosion resistance, high tensile strength, low young's modulus, lightweight and low electrical conductivity. In this paper, flexural behaviour of conventional Steel Reinforced Beam (SR) and Basalt Fiber Reinforced Polymer beam (BFRP) are investigated experimentally and the test results are discussed in detail. It is observed that BFRP beam shows higher deflection when compared to SR beams due to its low modulus of elasticity, flexural load carrying capacity of BFRP beam increases due to enhanced tensile strength property in basalt rebar, significant increasing the tensile strength in BFRP beam. The results shows that basalt rebar can be effectively used in construction as a replacement of conventional steel reinforcement for sustainable development.
Key words Basalt Fiber Reinforced Polymer, flexural behavior

ISDCP-049

Bio Concrete Crack Detection using Innovative Techniques

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Abstract

Concrete is widely valued for its strength and durability in construction. However, cracks can compromise its longevity, especially in applications such as pavements, buildings, and bridges. Bio-concrete, an innovative material incorporating bacteria like Bacillus megaterium, Bacillus subtilis, Bacillus sphaericus, Bacillus cohnii, Bacillus pseudofirmus, Bacillus alkalinitrilicus and Bacillus pasteurii, addresses this issue by self-healing minor cracks. When exposed to moisture, these bacteria produce calcium carbonate (calcite), which fills micro-cracks and prevents them from spreading, improving the concrete's durability without extra reinforcement. This self-healing process extends the lifespan of pavement blocks and reduces maintenance needs, making bio-concrete a sustainable choice.

Limited research has been conducted specifically on Bacillus megaterium, so this study focuses on its application in concrete. Materials were characterized, and an M40 grade concrete mix design was prepared following IRC 44-2017 guidelines. Cement concrete cubes and beams were cast with Bacillus megaterium added at a dosage of 1 to 3 grams per cubic centimeter of cement, with curing times of 7, 14, and 28 days. These specimens were then tested for compressive and flexural strength. Crack healing in concrete using Bacillus megaterium offers a promising solution for improving the durability of concrete structures. This process involves introducing the bacteria into the concrete mix, often in a dormant form, alongside a calcium-rich material like calcium lactate. Once cracks are induced through compression and flexural strength tests, the bacteria are activated by moisture and oxygen, triggering them to convert the calcium source into calcium carbonate. This precipitate fills the cracks, effectively healing them and potentially restoring the structural integrity of the concrete. Simple sensors were also used to monitor changes in the concrete's condition, helping to detect early signs of stress, strain, temperature, and moisture, which indicate potential cracks. Crack detection in concrete cubes and beams using piezoelectric sensors combined with an LCR meter (Inductance, Capacitance, and Resistance meter) is an innovative approach to monitoring the health of concrete structures. This method leverages the changes in the electrical properties of the concrete caused by the formation of cracks, and piezoelectric sensors can detect mechanical stress and strain associated with these changes.

Keywords: Bio-Concrete, Crack Detection, Calcium Carbonate Precipitation, Concrete Durability, Sustainable Construction

ISDCP-057

Performance Study on Cement Grout Bituminous Pavement By using GGBS, Fly Ash, Rice Husk Ash and Silica Sand

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Abstract

In our research, we studied the engineering properties of composite pavement using GGBS, FA (fly ash), RHA (rice husk ash), and Silica Sand. These substitute materials have been sieved through 300-micron and 75-micron IS sieves for use in cement grout. We are investigating the use of GGBS, FA (fly ash), RHA (rice husk ash), and Silica Sand as potential alternatives to standard grout. We are testing different combinations with GGBS at 20%, Fly Ash at 30%, Rice Husk Ash at 10%, and Silica Sand at 30%. The open-graded friction courses are sealed using this grout to assess the stability and compressive strength of grouted Marshall molds with a diameter of 100mm. Additionally, we have to assess the compressive strength of cement mortar by testing cubes measuring 70.6x70.6x70.6mm after curing for 7 and 28 days. Also, evaluate the flexural strength of mortar beams measuring 100x100x500mm and determine the split tensile strength of mortar cylinders 150mm in diameter and 300mm in depth after curing for 28 days. The compressive strength test showed that mortar cubes with 20% GGBS had the highest strength at 52.31 N/mm2, outperforming other materials. Mortar cubes with 30% Fly Ash had a strength of 49.67 N/mm2, and those with 10% RHA had a strength of 47.57 N/mm2. Mortar cubes with 30% Silica Sand had a strength of 50.61 N/mm2. The flexural strength results of mortar beams produced with 20% GGBS replacement showed a flexural strength of 9.8 N/mm2, which is higher compared to other materials. The split tensile strength results of mortar cylinders produced with a 20% GGBS replacement showed a split tensile strength of 3.335 N/mm, which is higher compared to that of

other materials. The tests were all carried out following a 28-day curing period. After the completion of 28 days of the curing process, the marshal stability of grouted molds was observed to be 9.71 kN when 20% of the GGBS was replaced with cement. When 10% rice husk ash was used, marshal stability was 8.47 kN; 30% fly ash resulted in 9.47 kN, and 30% silica sand gave 10.72 kN. The compressive strength of grouted molds with 20% GGBS was 4.9 N/mm2, while 30% Fly Ash showed 5.2 N/mm2, 10% Rice Husk Ash showed 3.5 N/mm2, and 30% Silica Sand showed 6.5 N/mm2. After analyzing the above findings, it is clear that GGBS can effectively replace cement. Combining a specific quantity of GGBS with cement results in stronger properties compared to other materials used. By incorporating these materials, we can significantly improve the strength of pavement construction.

Keywords: Composite Pavement, Cement Grout, Mortar Cubes, Compressive Strength, Flexural Strength, Split Tensile Strength

ISDCP-059

Application of Recycled Aggregates in Cement Treated Base Course

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Abstract

The construction of cement treated base (CTB) utilizing a mixture of natural and recycled aggregates presents a sustainable approach to infrastructure development. This project investigates the performance and feasibility of incorporating recycled aggregates into CTB, aiming to reduce the environmental impact and reliance on natural resources. Comprehensive testing of both aggregate types was conducted, including assessments of flakiness index, elongation index, specific gravity, water absorption, aggregate impact value, and aggregate abrasion value. These tests provided critical data for understanding the physical and mechanical properties of the aggregates. Following the individual evaluations, a thorough proportioning of natural and recycled aggregates was performed to achieve optimal gradation for the CTB mixture. According to the IRC and MORTH Specification, the required compressive strength value is 4.5 MPa to 7 MPa. The aggregate mix consisting of 40mm NA, 20mm RA, 10mm NA, and Quarry Dust with 5% cement content, exhibited the maximum compressive strength of 6.95 MPa among the mixes which fulfills the minimum UCS requirement for use in CTB construction. The findings from this research demonstrate that recycled aggregates can be effectively utilized in CTB construction.

Keywords: Cement Treated Base (CTB), Natural Aggregate (NA), Recycled Aggregate (RA), Unconfined Compressive Strength (UCS).

ISDCP-060

Use of Recycled Asphalt Aggregate and Fish Scale Powder in Self Compacting Concrete

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Abstract

Concrete is mainly composed of aggregates and cementitious materials, but the availability of natural minerals is declining. This challenge calls for an increased use of recycled aggregates and a reduction in cement consumption. Fish scale powder has emerged as a potential solution to enhance the Fiber content in concrete, offering both environmental and performance advantages. While previous studies have investigated the use of fish scale powder and recycled aggregate pavement (RAP) in self-compacting concrete (SCC), there is a lack of thorough research comparing their compressive strength and other performance aspects. Specifically, more research is needed on the mechanical properties, environmental impact, and economic feasibility of these materials in concrete production. This study aims to address these gaps by evaluating the potential of fish scale powder in SCC, its influence on Fiber content, and its effect on both the fresh and hardened properties of the concrete. The methodology includes collecting materials such as fish scale powder and recycled aggregates, and creating SCC mixes with different cementitious contents. Fresh properties, like workability and flowability, will be assessed, and compressive strength tests will be conducted on both normal SCC and SCC incorporating fish scale powder. The findings suggest that using RAP and fish scale powder in SCC enhances strength, with RAP up to 60% and fish scale powder up to 10%. Fish scale powder also improves Fiber content and acts as a cementitious material, boosting concrete strength after 28 days of curing. These results demonstrate the potential of creating sustainable, cost-effective, and environmentally friendly concrete.

Keywords: Environmental Impact, Economic feasibility, Fresh properties, Sustainability, Concrete strength.

ISDCP-061

Experimental Analysis of Mechanical Properties on Cement Grouted Bituminous Mixture

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Abstract

Cement grouted bituminous mixture (CGBM) are constructed by preparing an open graded bituminous mix with 20-30% of air voids and these voids are filled with selected cement mortar grout. The resulting composites, called as grouted mixes, this type of pavement combines both flexibility and rigidity properties i.e., asphalt pavement and cement concrete pavement respectively. This research evaluates the experimental studies on semi flexible pavement. In the present study, the cement mortar grout was selected based on its flowability and compressive strength criteria. In addition to that, to improve the flowability of cement mortar grout super-plasticizer was used. Open graded bituminous mix was

prepared for different binder content 4%,4.5% 5% & 5.5. The optimum binder content obtained was 4.5% and 5% from the following tests, air void content, drain down, cantabro abrasion and permeability test. To get accuracy the open graded bituminous mixes were prepared for all binder contents and voids were filled with selected grout. Marshall stability, Compressive strength, Flexural strength, Cantabro abrasion and Indirect tensile strength (ITS) tests were conducted for prepared grouted mixes, over a curing period of 28 days. The tests result show that grouted mixes had superior properties over conventional mixes.

Keywords: Cement grouted bituminous mixture, Indirect tensile Strength, Super-Plasticizer, Open Graded Friction Course, Cantabro abrasion, Permeability

ISDCP-066

Impact of Wind and Seismic Load on the Behaviour of Shear Wall

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Abstract

The structural integrity of multi-storeyed buildings is critically influenced by their ability to withstand seismic and wind loads. This study evaluates the performance of wall replacements in multi-storeyed buildings under such dynamic loads. The research focuses on analyzing the impact of different types of wall materials and configurations on the overall stability and resilience of the building structure during seismic events and high-wind scenarios. Using advanced computational modelling and simulation techniques, the study investigates the variations in stress distribution, displacement, and deformation patterns when conventional wall materials are replaced with alternative materials such as reinforced concrete, steel, or composite materials. The findings highlight the importance of selecting appropriate wall materials and designs that optimize both safety and cost-effectiveness. The results provide valuable insights for structural engineers in the design and retrofitting of buildings to enhance their performance under adverse loading conditions. The examination focuses on the displacement values, maximum story drift, and story shear for different configurations, particularly emphasizing Model 4, which incorporates shear walls in both the X and Y directions. The findings indicate that Model 4 exhibits superior performance, demonstrating reduced displacements and drifts while adhering to the limits specified in IS875-2002. This configuration enhances lateral stiffness and structural integrity, making it the most effective choice for mitigating the impacts of seismic and wind forces on multi-storey buildings. Additionally, a comprehensive time history analysis was conducted for all the models to assess their performance under real seismic events. The results indicated that Model 4 consistently delivered the best performance across the board, exhibiting minimal displacements and effectively managing dynamic loads. This reinforces the efficacy of incorporating shear walls in both axes, validating Model 4 as the optimal design for enhancing resilience against seismic and wind forces in multi-storeyed structures.

Keywords: Multi-storeyed buildings, Story drift, Story Displacement, Story Shear, Time Period, Time history, Shear wall.

ISDCP-069

Eggshell and Fish Scale Powder as Biomaterials in Concrete: A Step Towards Sustainable Infrastructure

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Abstract
Cement is crucial for infrastructure and economic growth but significantly impacts the environment, contributing about 8% of global CO2 emissions due to calcination and fossil fuel use. Global cement production exceeds 4.4 billion metric tons annually, with China leading at over 50% of the total output. India, the second-largest producer, contributes around 370-380 million metric tons, driven by infrastructure and urbanization demands. Its production also depletes raw materials like limestone and clay, causing resource depletion and land degradation. Additionally, cement plants emit pollutants such as NOx, SO2, and particulate matter, harming air quality and health. To mitigate these impacts, strategies include using alternative materials, improving energy efficiency, and developing green cement and carbon capture technologies. Utilizing by-products like eggshells and fish scales in composite materials offers a promising solution. These waste materials enhance concrete's mechanical properties and reduce environmental footprints by minimizing waste and CO2 emissions. Eggshell powder (ESP) improves concrete strength, impermeability, and setting time, ideal for precast industries, with a 15% optimal replacement level balancing strength and durability. Fish scale powder (FSP) enhances concrete's strength, flexibility, and thermal resistance, with a 2% replacement being optimal. Incorporating eggshells and fish scales into construction aligns with green building practices, promoting energy conservation, cost reduction, and sustainability. These by-products not only enhance concrete performance but also help mitigate the environmental impacts of cement production, leading to a more eco-friendly and efficient construction industry while maintaining structural integrity and durability.

Keywords: Bio- materials, Egg shell powder, Fish scale powder, Workability, Mechanical and Durability Properties.

ISDCP-071

Use of Plastic Aggregates in Concrete by Partial Replacement to Natural Granite Coarse Aggregates

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Abstract

In this work, plastic waste is considered for the suitability checking in concrete by partial replacement to the naturally available granite coarse aggregates. Plastic wastes like polythene covers used as a carry cover of less than 40 microns were collected from garbage were used as handmade Plastic Aggregates (PA) for partial replacement to natural coarse aggregates and these aggregates were tested on the controlled mix 20 MPa and tested for workability on fresh state and compressive strength on hardened state. With the help of this workability on fresh state and compressive strength on hardened state,

detailed testing conducted on PA by partially replacing it with naturally occurring granite coarse aggregates for the controlled mix of 30MPa. PA were shown normal values up to 10% and beyond it starts reducing it strength. As a sample of precast members, interlocking pavers were casted to check the compressive strength by using PA.

Keywords: Handmade Plastic Aggregates (PA), Interlocking Pavers, M30 Grade Concrete

ISDCP-074

Impact of Performance Assessment of Mono-Column and Floating Column Structures on Varying Terrain Conditions with Identical Plan Area Under Seismic Forces

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Abstract

Structural analysis plays a crucial role in understanding the impact of wind and seismic loads on buildings. While much research has focused on the design and analysis of single-column structures, modern architecture often introduces additional complexities. One such complexity is the use of floating columns, a common feature in high-rise buildings. Floating columns are typically employed to increase the Floor Space Index (FSI) due to architectural and functional constraints. However, these columns create irregular load transmission paths, which can negatively affect a structure's seismic performance. The disruption of the ideal load path caused by floating columns is highlighted in IS: 1893:2016, Clause 7.1, which restricts their use. Despite these limitations, there remains considerable interest in finding solutions to mitigate the risks associated with floating columns in seismic conditions. This study utilizes SAP 2000 software to model, analyze and design single-column structures of varying sizes located on the second floor of 3, 8 and 10-story buildings. Both static and dynamic analyses are conducted with the primary goal of identifying the most vulnerable and efficient structural forms in seismically active regions. Key parameters, including base reactions, element stresses, joint displacements, and accelerations are evaluated. The ultimate aim is to develop design strategies that minimize earthquake-induced damage to the building and its components. The findings indicate that the three-story floating column structure exhibits significantly lower stresses and displacements compared to the mono-column design, which can enhance both seismic performance and material efficiency. The eight-story mono-column structure on the other hand shows extremely high stresses and displacements, suggesting potential stability and safety concerns under seismic loads. Similarly, the ten-story mono-column structure demonstrates very high displacements pointing to possible over-stressing of the system. In contrast, the floating column structure performs better, with lower stresses and displacements offering a more favorable response to seismic forces.

Keywords: Monocolumn, Floating Column, SAP, Response Spectrum Analysis, Base Shear and Element Stress

ISDCP-075

Green Paving Solutions: Economical Concrete Mix Design with Iron Ore Tailings and GGBS

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Abstract

Goa is rich in iron ore deposits and has witnessed extensive mining operations, leading to approximately 7.7 million tons of Iron Ore Tailings (IOT) as a by-product in last two decades. These tailings are commonly disposed of in quarries, landfills, and tailings dams, resulting in severe environmental damages. This study investigates the feasibility of using IOT as a partial substitute for fine aggregate and Ground Granulated Blast-Furnace Slag (GGBS) as a partial replacement for cement in concrete paver manufacturing. Fifteen concrete mixes were formulated, incorporating varying proportions of Portland cement, GGBS, Manufactured Sand, IOT, and Coarse aggregate. Chemical analysis of the IOT revealed a composition of 63.09% Fe_2O_3 and 17.9% SiO_2, while GGBS primarily consists of Calcium Oxide, Silicon Dioxide, and Aluminum Oxide. Experimental results showed that to maintain a consistent slump, a higher dosage of admixtures was required as the amount of IOT increased. The maximum compressive strength achieved was 45.37 MPa with a combination of 10% IOT and 20% GGBS. However, the most economically viable mix for practical purposes comprised 30% IOT and 20% GGBS, exhibiting a 28-day compressive strength of 41.61 MPa. These findings demonstrate the feasibility and environmental benefits of reusing IOT in concrete paver production.

Keywords: Iron Ore Tailing, GGBS, Pavers, Mix Design

ISDCP-080

An Experimental Analysis of Artificial Aggregate using Granite Dust and Fly ash

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Abstract

Advancement of new strategies for handling wastes is the significant regions of enthusiasm of analysts lately. This is because of the requirement for reusing the resources to abstain from debilitating natural resources which is exhausted richly with developing inhabitants. Natural aggregates are selected from normally happening rocks by breaking and separating particles using different mesh size in to wanted dimension. The usage of characteristic totals becomes key problem, because of the over consumption of these ingredients right now period. The current examination on fake coarse total has a lot of significance. This study is to encourage use of environmentally friendly materials in construction and promote industries to transfer their waste to the treatment units.

Keywords: Artificial Aggregates, Fly ash, Debris, Light weight coarse Aggregate.

ISDCP-081

Analyzing Structural Performance for Concrete-Filled Steel Tube Members

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Abstract

This study examines how rectangular concrete-filled steel tubes (CFST) with non-compactor, compacted narrow component sections behave and perform. Experimental and numerical data showed generally satisfactory correlations for the composite material's maximum bending strength and curved trend of moment against mid-span displacement relations. The next step was to analyze the typical residual deformations and failure pattern of the core concrete using finite element analysis (FEA) models of the outer steel and load distributions across the composite section during the loading procedure. The analysis shows that the CFST beam has a high flexural capacity and flexibility because the composite structural member combines steel and concrete to distribute stress. Lastly, the internal consistency method is applied to composite beam design formula. Characterization techniques was used in XRD, SEM with EDX, and FTIR at maximum level of 10500C and also evaluated in carbon emissions. The ductility and stress distribution of CFST beams and columns are predicted by design methods, and these predictions are in good agreement with the experimental results of this study and the existing literature.

Keywords: Composite Materials; Concrete Filled Steel Tube; Finite Element Analysis; Characterization; Carbon Emission

ISDCP-084

Systematic Literature Review on The Readiness of Enhances in the Construction Industry in Addressing Re-Use and Reduction Of Construction Demolition Waste (CDW)

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Abstract

The construction industry generates a significant amount of Construction and Demolition Waste (CDW), contributing to environmental degradation and inefficiencies in resource utilization. Despite growing awareness of sustainability, many enables within the industry struggle to implement effective strategies for the re-use and reduction of CDW. The absence of a standardized framework to assess organizational readiness for addressing CDW limits progress towards more sustainable practices. This study aims to develop a comprehensive framework for assessing the readiness of enables in the construction industry to effectively manage CDW through re-use and reduction strategies. A review of existing literature reveals a gap in specific, actionable tools for evaluating organizational preparedness in this area. The methodology involves a mixed- methods approach, combining qualitative interviews with industry professionals and quantitative surveys to gather data on current practices, barriers, and opportunities. Based on the findings, a multi- dimensional framework was developed, identifying key factors such as leadership commitment, employee training, technological adoption, and regulatory

compliance as critical components of organizational readiness. The study found that most construction enables exhibit low to moderate readiness, with significant gaps in workforce training and the integration of sustainable technologies. The proposed framework offers a practical tool for organizations to evaluate their readiness and identify areas for improvement. These findings have important implications for policymakers, industry leaders, and sustainability advocates in designing targeted interventions to enhance CDW management practices. The framework can also serve as a benchmark for measuring progress in construction sustainability initiatives.

Keywords: Construction & Demolition Waste, Circular Weak Environment Regulations, Re-utilization of Building.

ISDCP-085

Investigation of Composite Column Compression Behavior using Experimentation and Data-Driven Modeling

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Abstract

Strengthening concrete columns using external applications has gained significance in the construction industry for many years as the constructed facilities deteriorate. Carbon Fiber Reinforced Polymer (CFRP) application is widely popular among all strengthening techniques for concrete structures. Further, concrete compression behavior is a complex phenomenon involving several interdependent factors controlling it. Therefore, modeling column behavior involving some key factors is considered relevant. Upon these premises, this research aimed to investigate the strength prediction of concrete columns of various configurations using experimental and machine learning approaches. 24 concrete columns of different configurations of M40 concrete grade and cross-sections 200 mm x 200 mm x 700 mm with and without CFRP were subjected to uniaxial concentric compression loading till failure. A Python-based machine learning algorithm was employed to formulate the model for the test data for column capacity prediction. In conclusion, the study experimentally examined the behavior of concrete columns to gain insights into concrete compression behavior and strength enhancement due to CFRP application and also presented a Python-based computational framework for the machine learning algorithm used on the experimental data.

Keywords: Carbon Fiber Reinforced Polymer, Column, modelling

ISDCP-090

Analysis and Design of Steel Truss Structures Using STAAD Pro

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Abstract

The design of steel trusses is a critical aspect of structural engineering, providing efficient and cost-effective solutions for a wide range of applications, including industrial buildings, bridges, and roofing systems. This paper explores the analysis and design of steel truss structures using STAAD Ro, a widely used structural analysis and design software. The process involves modeling the truss geometry, assigning material properties, defining loads and boundary conditions, and conducting structural analysis to ensure safety and serviceability under various loading conditions. Additionally, optimization techniques are applied to achieve economical design solutions while adhering to relevant design codes. The study highlights the versatility of STAAD Pro in handling complex truss configurations and demonstrates its efficacy in reducing manual computational effort. The results emphasize the importance of precise modeling, load considerations, and design validation to achieve robust and efficient steel truss structures.

Keywords: Steel trusses, STAAD Pro, structural analysis, truss design, load optimization, structural engineering, design codes, modeling techniques

ISDCP-093

Analysis of Load Carrying Capacity of RCC Columns by Varying the Conventional Quantity of Cement Concrete

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Abstract

Hollow columns are widely used while constructing bridges they have less seismic mass which makes the superstructure safer as compared to those solid columns. Also, this kind of structural member may be economically viable as to the solid once. The proposed project aims to study the columns and their design and analysis of load carrying capacity of columns with known cross-sectional area and percentage of reinforcement for rectangular section, thus determining the ratio between the cross-sectional area and load carrying capacity of the rectangular cross-sectional areas of the column. The behaviour of columns has been the subject of research for many years. Despite this the problem is still not fully understood and design methods are, for most part, based on empirical formulae. The recent development of the Limit state approach to design has focused particular attention on two requirements: accurate information regarding the behaviour of structure throughout the entire range of loading up to ultimate load, and simple procedure to enable designers to access this behaviour. The work described in this report attempts to satisfy these requirements in the case of reinforced concrete columns.

Keywords: rectangular section, reinforced concrete columns

ISDCP-094

Experimental Study on Transparent Concrete using Rice Husk Ash and Glass Optical Fibers

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Abstract

The main material used for any construction is concrete for centuries due to its robustness, versatility, and relative affordability. The concrete that was using from past years is opaque in nature that provides structural integrity but is aesthetically limited in its natural form. In the field of construction idea of developing a transparent concrete was marked as significant innovation. This was achieved by incorporating optical fibers into the concrete mixture. As per the IS 10262 and IS 456 standards detailed calculations were conducted to determine the appropriate water-cement ratio, air content, and aggregate proportions. Specimens were prepared using precise batching, mixing, casting, and curing processes. Compressive strength tests were performed at 7 and 28 days, revealing that concrete with RHA and optical fibers exhibited competitive strength compared to conventional concrete. Light transmittance tests demonstrated the effectiveness of optical fibers in transmitting light, with significant voltage and current measurements. The findings suggest that transparent concrete has substantial potential for energy-efficient building designs by enhancing natural light usage while ensuring structural integrity. This study addresses gaps in current research by providing comprehensive data on the mechanical properties and light transmission capabilities of transparent concrete, paving the way for further advancements in sustainable construction materials.

Keywords: Transparent concrete, rice husk ash, glass optical fibers, energy-efficient building.

ISDCP-095

Effect of Use of Banded Hematite Jasper (BHJ) and Reclaimed Asphalt Pavement (RAP) in Bituminous Concrete Grade -I Mix

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Abstract

The study investigates the impact of Banded Hematite Jasper (BHJ) and Reclaimed Asphalt Pavement (RAP) on the Marshal parameter and fatigue behavior of bituminous concrete grade-1 mix. The study aims to determine the feasibility of utilizing these materials as sustainable alternatives in road construction. The research involves laboratory testing of bituminous concrete mixtures containing 10% & 15% BHJ and RAP. The Marshal parameter, which evaluates the compatibility and mechanical properties of the mix, is assessed. Additionally, the fatigue behavior of the mixtures is analyzed to understand their resistance to repetitive loading. The results reveal that incorporating 10% & 15% BHJ and RAP in the bituminous concrete grade-1 mix positively affects the Marshal parameter and fatigue behavior, indicating their potential as viable materials for improving the performance and sustainability of bituminous concrete grade-1 mix.

Keywords: Bituminous Concrete Mix, Marshall Parameter, Banded Hematite Jasper, Fatigue.

ISDCP-096

Waste Paper Concrete

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Abstract

Waste paper concrete, an eco-friendly alternative, this study investigates the effect of saturated shredded waste paper on properties of concrete by focusing on its workability, consistency, and its mechanical property. Shredded waste paper refers to paper that has been cut into small pieces or strips. Recycling centres indeed face challenges with sorting shredded paper due to its small size and broken fibres. Utilizing waste paper as an addition in concrete production can help reduce environmental pollution. This research investigates the effect of saturated shredded waste paper (using office papers and cardboard waste paper) as additives on the compressive and flexural strength, as well as water absorption of hardened concrete and dead load of the concrete. Waste paper concrete, an innovative sustainable material, integrates shredded waste paper as a partial replacement of 5% and 10% for fine aggregates. The workability and consistency of fresh concrete were assessed using standard tests, such as the slump test, to evaluate the ease of handling and placing. Mechanical properties, including compressive strength, flexural strength and split tensile strength were also measured to assess the structural integrity of the concrete. Preliminary results indicate that the inclusion of waste paper influences the workability and consistency of concrete, with higher proportions potentially reducing workability.

Keywords: Shredded Waste Paper, Compressive strength, Tensile strength and Workability

ISDCP-097

A Study on Interface Failure Behaviours in Recycled Coarse Aggregate Concrete under Flexure with DIC

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Abstract

The interface is a common occurrence of joint between old and new concrete or hard-set casted concrete to new fresh concrete, it is also termed as interfaces in casting concrete, which is also weak as like ITZ but it is a macro-scale problem. The performance of these weak interfaces in fracture is much more complicated and important in the field of interface failure of quasi-brittle materials. The flexure fracture studies are carried for the different interface created in transfer face of hardened concrete to fresh concrete in terms of intact, normal & grooved interface across the notch, which represent strong and possible weak interfaces for self-similar specimens of recycled aggregate concrete. The interface is studied for a single & bi-material interface of recycled and conventional concrete designed for a unique water cement ratio. The non-linear fracture properties are arrived at from the principles of Bazant's size effect method from the experiments and also through post-processing images captured during the test.

The fracture test is carried under CMOD control for all the series of CAC & RAC, the fracture properties at interfaces are evident for the possible strong & weak interface as intact and grooved at the transverse face of the specimen. The transfer grooved interface is provided to represent the aggregate interlocking casted in phase, as the study proved to be a weaker interface than the normal way of casting for both single and bi-material interface. The crack will follow the weak interface path along the notch for normal and grooved interface and intact follows the path of ITZ. The failure is unique in both materials interfaces but in the RAC- RAC interface the crack is not only initiated in the interface but also arises from the weak aggregate interface and also due to the failure of weak aggregates. The FPZ width ahead of the crack is more intense in RAC interfaces, indicating an increase in strain area due to the active or weak interface in recycled aggregates. The strain distribution diagram of RAC &CAC in failure, a significant difference is observed, localization of strain ahead of crack tip in RAC interface than CAC interface. Using the non-linear fracture properties of interfaces, the peak load for failure of different interfaces is arrived by stress and strain-based approach methods.

Keywords: RAC, Interface, DIC, Non-Linear Fracture properties, SEM.

ISDCP-098

Experimental Investigation on the Production of Geopolymer Concrete by Blending Cinder and Fly Ash Aggregates

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Abstract

The project involves the utilization of GGBS and FLYASH along with alkaline activators i.e., sodium hydroxide which facilitate the alkali activation process for producing structural geo-polymer concrete (GC). This project is involved in the usage of aggregates with lesser specific gravity compared to conventional concrete. Present work is involved in using the aggregates in combination with natural and Pozzolanic states. Pozzolanic aggregates used here are fly ash aggregates which are prepared in the laboratory and the natural light weight aggregates used in the project are cinder. Different percentage combinations of fly ash aggregates and cinder aggregates (i.e,0%-100%,20%-80%,40%-60%,60%-40%,80%-20%,100%-0%) with water were added to the concrete mixtures to determine how they affected the overall performance. The alkaline to binder ratio used in the experiment is 0.4. The optimum mix proportion obtained from the compressive strength is 20% (Fly ash Aggregate)-80%(CINDER) And the percentage increase from 3,7 and 28 days is varied more in this mix proportion. This optimum mix proportion is further used in compression tests, Flexural, Split tensile tests and water absorption tests, The optimum compressive strength obtained is 24.7 Mpa, the durability properties is also tested like fire resistance (resists 800°C), acid and Sulphur resistance, it satisfied all the properties so this geopolymer concrete can be used in the construction purpose.

Keywords: Alkaline activators, Pozzolanic aggregates, Optimum mix proportion, Geopolymer

ISDCP-099

Confinement Effect in Short CFST Columns Filled with Recycled Aggregate Concrete: An Experimental Study

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Abstract

Concrete Filled Steel Tubes (CFST) are a types of steel concrete composite structural member used extensively worldwide predominantly as axial members. A CFST member typically comprises a hollow steel tube with a concrete core. This combination enhances the performance of the materials forming the CFST: the steel tube enhances the strength of the concrete core by providing the confining effect and the concrete core prevents the buckling of steel. As a result, the strength of the CFST member is the combined strength of its components and additional benefits from the confinement effect. Furthermore, the construction industry produces large amounts of waste annually, causing disposal and environmental issues. Utilizing construction waste as recycled aggregates (RAs) offers a sustainable solution, reducing disposal issues while contributing to eco-friendly construction practices. With this background, an experimental investigation was carried out to examine the confinement effect in short CFST columns filled with concrete made of RAs. Short CFST columns were prepared using four different concrete mixes with replacement ratios of 0%, 25%, 50%, and 100%, where the replacement ratio is the mass of RAs relative to natural aggregates (NAs). The columns were tested until failure and results were recorded. It was found that the confinement effect was governed by the strength of the core concrete with the degree of confinement increasing with a decrease in the concrete core strength. It was also observed that the contribution of steel tube to the axial load resistance increased with higher replacement ratio. Further, the results of experimental tests were compared with the recommendations of international standards such as AISC 360 and EC4. Thus, the study highlights the potential of RA-based concrete in CFST applications, offering a sustainable and effective alternative for modern construction needs.

Keywords: Concrete Filled Steel Tubes, Recycled Aggregates, Experimental Study, Confinement Effect, Replacement ratio.

ISDCP-100

Assessment on Leachate Characteristics of Red Mud Stabilized with Fly Ash and Ground Granulated Blast Slag in Subgrade Applications

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Abstract

Handling industrial waste is a significant challenge for many industries around the globe. Industrial waste application has recently become very common in various construction activities like manufacturing bricks, tiles, embankments, subgrade, subbase applications and etc. However, the impact of these industrial waste materials in contact with the water was not given much importance in many studies. In this study, red mud, an industrial waste produced during the extraction of aluminum from bauxite ore, was used as raw material and stabilized with 10%, 20% and 30% of fly ash and GGBS. Studied the strength properties of red mud–fly ash and red mud-GGBS combinations by conducting California bearing ratio (CBR) and Unconfined compressive strength (UCS) tests for different curing periods. Achieved a maximum CBR of 11.17% and 28days UCS of 4112 kPa. All the strength property results showed that these combinations were highly recommended for the construction of subgrades according to the Indian Road Congress (IRC 37) specifications. The Toxicity Characteristics Leaching Procedure (TCLP) method was used to collect the leachate from all the combinations. Chemical Analysis was performed on all the collected leachate samples to assess the concentration of various heavy metals present in it and compared the results with the WHO standards and TCLP hazardous limits for heavy metal concentrations. Results confirm that all the heavy metals are within the permissible limits of TCLP hazardous limits and support the application of stabilized red mud as a subgrade material in road construction.

Keywords: Aluminum waste, chemical analysis, road constructions, strength properties

ISDCP-105

Behaviour of Steel-Concrete Composite Columns under Axial Compression

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Abstract

The current study investigates the strength and failure mechanisms of Single-skinned Steel-Concrete Composite columns (SSCCs), with a use of core concrete of grade M30. SSCCs offer enhanced strength, stiffness and durability by leveraging the synergies between steel and concrete. However, the column failure poses significant risks to structural integrity, particularly in important structures such as high-rise buildings, bridges and industrial structures. This research explores the intricate relationships between steel-concrete interaction, buckling of column and material degradation of composite columns, highlighting the critical role of core concrete in ensuring the improvement of load-carrying capacity, stiffness and durability compared to reinforced concrete columns. The findings provide valuable insights for developing more resilient and efficient column designs and demonstrate the potential of SSCCs as a practical and efficient solution for modern construction applications.

Keywords: steel-concrete composite columns, failure mechanism, buckling behaviour, structural integrity.

ISDCP-115

Assessment of Mechanical Properties of Sustainable Concrete Made of Dry Sewage Sludge

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Abstract

The increasing generation of sewage sludge poses significant environmental challenges, with most of it being disposed of in landfills or through incineration. This study aims to explore the potential of using dry sewage sludge (DSS) as a sustainable alternative material in concrete production. The primary objective of this research is to evaluate the mechanical properties and microstructure of concrete incorporating dry sewage sludge as a partial replacement for fine aggregates. Various concrete mixes were prepared by replacing 3%, 6% and 9% of fine aggregate with dry sewage sludge by weight. The experimental program focused on assessing the compressive strength, tensile strength, flexural strength, and durability of the concrete specimens at different curing ages (14, and 28 days). The results indicate that concrete made with up to 10% dry sewage sludge showed satisfactory mechanical performance, with compressive strength values comparable to conventional concrete. However, higher replacement ratios resulted in a notable decrease in strength, likely due to the increased porosity and the presence of organic matter in the sewage sludge. This study demonstrates that dry sewage sludge can be effectively used as a partial replacement for fine aggregates in concrete, providing a sustainable solution for both waste management and the production of eco-friendly building materials. The findings suggest that an optimal replacement level of 3% dry sewage sludge offers a balance between mechanical performance and environmental benefits, although further research is needed to refine mix proportions and curing conditions for large-scale applications.

Keywords: sustainability, dry sewage sludge, solid waste management, mechanical properties

ISDCP-116

A Comprehensive Review of Bridge Bearing Systems: Types, Applications, and Innovations

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Abstract

The use of bridge bearings is essential for maintaining structural integrity and facilitating movement between substructures and superstructure. This review covers a variety of bridge bearings, including sliding, rocker and pin, roller, elastomeric, pot, and disk bearing. It demonstrates improvements such as reinforced steel-elastomeric bearings, which make them more durable with high axial loads. A major focus of this review is on the selection process, taking into account functional requirements, lifecycle costs and maintenance needs. It also addresses the issue of long-term bridge stability through bearing design, addressing issues such as thermal expansion, creep and seismic resilience. To address common

bearing issues, preventive and correct maintenance methods are examined. GPS and sensor-equipped monitoring systems are among the latest advancements that aim to enhance reliability by preventing breakdowns. This review is designed to help engineers and stakeholders improve performance of bridge bearings in order to make them last longer and more reliable on bridge structures.

Keywords: Bridge bearing, structural integrity, seismic resilience, life-cycle cost, preventive maintenance.

ISDCP-117

Mechanical Properties of Geopolymer Concrete

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Abstract

Geopolymer concrete (GPC) is an environmentally sustainable alternative to traditional concrete, utilizing industrial by-products such as fly ash and ground granulated blast furnace slag (GGBS) as binders, activated by an alkali solution. This innovative material significantly reduces carbon emissions while delivering excellent mechanical and durability properties. In this study, physical tests were conducted on constituent materials, including fine aggregate, coarse aggregate, fly ash, GGBS, and alkali solutions, to assess their quality and suitability. Tests such as particle size distribution, specific gravity, bulk density, and fineness modulus were performed. Experimental investigations revealed that the compressive strength and flexural strength of geopolymer concrete increase with the age of the concrete. The compressive strength varies based on the proportions of fly ash and GGBS. The optimal mix was identified as 30% GGBS and 70% fly ash, achieving compressive strengths of 28.86 MPa and 33 MPa for different mix proportion. These findings demonstrate the potential of geopolymer concrete as a high-performance, sustainable alternative for reducing the environmental impact of conventional cement-based construction.

Keywords: Geopolymer concrete, Sustainable, Industrial by-products, Aluminosilicate materials, Alkaline solutions, Carbon dioxide emissions.

ISDCP-119

Physical and Chemical Analysis of Heritage Structures

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Abstract

Heritage structures represent a significant part of global cultural identity, yet they are increasingly threatened by environmental degradation, pollution, and aging. Understanding their chemical composition and deterioration mechanisms is crucial for their preservation. This review explores recent research on the physical, biological, and chemical stresses impacting heritage materials, alongside

innovative mitigation techniques. Studies on ancient mortars and building stones emphasize the importance of characterizing material properties using advanced analytical methods (e.g., XRD, SEM-EDS, FTIR) to develop compatible repair materials. Sustainable approaches to heritage preservation, including biocides, nanoparticles, biological agents, and physical techniques, are critically examined for their efficacy and limitations. Case studies, challenges, and recent advancements are discussed, providing a roadmap for future research to develop sustainable and effective preservation strategies. This practice is essential for guaranteeing the enduring preservation and safety of these buildings, thereby securing their legacy for future generations.

Keywords: Heritage structures; Energy Dispersive X-ray analysis; scanning electron microscopy; structural health monitoring; deterioration of monument.

ISDCP-121

Assessment of Agro-Waste based Cementitious Materials

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Abstract

Agricultural by-products such as rice husk ash, sugarcane bagasse ash, and coconut shell ash are increasingly recognized as effective supplementary cementitious materials due to their pozzolanic properties. This study evaluates the mechanical properties, durability, and overall performance of cementitious materials incorporating these agro-wastes, focusing on their potential for sustainable construction applications. Experimental methods, including compressive strength, flexural strength, and durability tests, were employed under various mix proportions and curing conditions. The integration of agro-waste in concrete addresses critical global issues, such as the growing demand for natural resources caused by urbanization and the environmental challenges of agricultural waste disposal. Developed nations, in particular, face difficulties in managing agricultural residues, creating opportunities for their reuse in construction. Agro-waste materials are increasingly used as partial replacements for conventional concrete components, including cement, fine aggregates, and coarse aggregates. Their adoption promotes sustainability by reducing resource consumption, minimizing waste, and lowering costs. However, challenges like variability in composition, preprocessing requirements, and lack of standardization must be resolved to ensure their widespread application. This research demonstrates that agro-wastes, when leveraged for their pozzolanic characteristics, can reduce environmental impact while maintaining or enhancing the performance of construction materials. These findings highlight agro-waste's potential to drive the construction industry toward greener, more sustainable practices, ensuring economic and environmental benefits without compromising material quality.

Keywords: Agro-waste, cementatious materials, coconut shell ash, sugar cane baggase ash, groundnut shell ash, saw dust.

ISDCP-123

Performance based Seismic Design of Site-Specific G+10 RCC structures

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Abstract
Earthquakes across various regions of the world have highlighted the devastating impact of inadequate structural designs and the vulnerability of buildings to seismic forces. In India, many reinforced concretes (RC) framed structures in high-seismicity zones are constructed without adhering to seismic code provisions, posing significant risks to occupants. The primary cause of failure in multi-storey, multi-bay RC frames during seismic activity is often the soft storey sway mechanism or column sway mechanism. Seismic inertia forces generated at each floor level are transmitted through beams and columns to the ground. Since the failure of a column can compromise the entire building's stability, while the failure of a beam generally causes only localized damage, it is preferable to design beams as ductile weak links rather than columns. This design approach, known as performance-based design, represents the future direction for earthquake-resistant design of multi-storey, multi-bay RC frames. The objective of this project is to provide a detailed example of three-dimensional seismic analysis and performance-based design for a five-storey building.

Keywords: Earthquake, beams, columns, soft storey, seismic forces, reinforced concrete framed structures

ISDCP-124

Seismic Analysis of Irregular Multistorey Building in Various Zones

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Abstract

In India, the high value and scarcity of land might occasionally lead to the construction of multi-story buildings. One of the phenomena that could produce the most damaging forces on structures is an earthquake. The seismic response of these civil constructions is examined, wind force is computed, and forces such maximum story displacement, maximum story drifts, and maximum story shear are computed in order to prevent major structural damage. The main goal is to create an earthquake-resistant construction by using the Equivalent Static Method to analyse the structure's seismic studies in ETABS software. A G+10 residential building plan is taken into consideration for this purpose, and seismic calculations are carried out for different zones.

Keywords: Seismic Analysis, Multi story irregular buildings, Equivalent Static Method

ISDCP-127

Structural Health Monitoring Systems: Reducing Costs and Extending Bridge Lifespans

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Abstract

The primary goal of this study is to create a comprehensive monitoring system for assessing the durability of bridges. This system should connect with current practices, mainly reliant on visual inspections, and merge the findings from various dependable sensors attached to the structure, which monitor damage progression, with improved realistic deterioration models. The developed system and sensors aim to address key parameters related to critical deterioration mechanisms, including corrosion of bridge reinforcements, concrete carbonation, freeze-thaw cycles, alkali-silica reactions, and mechanical damage, as well as changes in structural behavior and safety such as static deformation, strain, crack width, and vibrations (frequencies, amplitudes, accelerations, and vibration modes).Damage mechanisms can be anticipated by tracking essential physical and chemical material parameters (like temperature, humidity, and pH levels in concrete, measured at the surface and through the concrete's thickness, as well as the corrosion rate of reinforcement) along with significant mechanical metrics (such as strain, deflection, and vibration).Once the permanent monitoring system is deployed, it provides various advantages: (i) a 25% reduction in inspection and maintenance costs, and a 30% decrease in traffic-related expenses by lowering the frequency and extent of site inspections and (ii) a 10% overall decrease in bridge lifecycle costs through enhanced lifetime prediction models used from the design phase onwards.

Keywords: Structural Health Monitoring, Bridge durability assessment, Deterioration mechanisms, Vibration Analysis

ISDCP-130

Impact of Openings in Reinforced Concrete Beams: A Systematic Literature Review on Strengthening Techniques and Case Studies

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Abstract

This systematic literature review examines the impact of openings in reinforced concrete beams, focusing on the structural implications and various strengthening techniques. Openings, often necessary for utilities, compromise the beams' shear and bending capacities, affecting overall performance. The review explores different methods to mitigate these effects, with an emphasis on FRP strengthening methods and steel casing applications, which enhance load capacity, reduce crack propagation, and improve structural behaviour. It also discusses the influence of opening shapes and locations on stress

concentrations and stiffness reductions. Case studies and numerical analyses, particularly using finite element modelling tools like ANSYS, are highlighted to validate experimental findings. The review underscores the importance of optimizing strengthening designs to ensure safety and functionality in modern construction. Recommendations for integrating these techniques into construction practices, addressing research gaps, and future research directions are provided.

Keywords: Structural Openings, FRP Strengthening Techniques, steel casing applications.

ISDCP-131

Study on the Development of the Ultra High-Performance Concrete using different Curing Regimes

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Abstract

This study investigates the effects of different curing regimes on the development of Ultra high-performance concrete (UHPC), focusing on hydration kinetics, compressive strength, and durability characteristics. The development of Ultra High-Performance Concrete (UHPC) has garnered significant interest due to its superior mechanical properties, durability, and versatility in modern construction. However, achieving the desired performance requires precise control over the curing process, as curing regimes directly impact the microstructure and overall properties of the material. Prepared mixes of UHPC using fine aggregates, silica fume, superplasticizer, and low water-to-binder ratio with variation of curing regimes. Accelerated curing compared to traditional ambient curing and steam curing for a range of temperatures and humidity conditions. The study concentrated on the monitoring of early-age strength development, long-term mechanical performance, shrinkage, and resistance against chloride ion penetration. Results will show that accelerated curing methods significantly improve early- age strength, whereas steam curing produces more refined microstructure, improving durability attributes such as cracking and chloride ingress resistance. However, for ambient curing, the best long-term mechanical performance was obtained, which may indicate an inherent trade- off between early strength gain and long-term durability depending on the curing regime. This research will contribute insights into the best curing strategies for UHPC and guide practice towards achieving both adequate early strength and satisfactory long-term durability, which are essences in high-performance construction applications.

Keywords: Ultra-High-Performance Concrete (UHPC), Mechanical properties, Stiffness, Compressive strength, Crack resistance, Durability, Curing methods

ISDCP-133

A Study on Impact of Quality of Materials on the Development of Ultra High-Performance Concrete

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Abstract

Project gives an extensive study into the use of ultra-high-performance concrete in particular in terms of strengthening and improving durability through fiber reinforcement. The high strength and high resistance to environmental degradation besides high tensile strain at failure grant ultra- high performance concrete a huge potential for sustainable construction. It provides a global acceptance of ultra-high-performance concrete and its development based on providing its production in bridges, building parts, and several industrial applications. Moreover, the study will report fiber influence: steel, glass, and synthetic fibres on UHPC's compressive, tensile, and flexural properties. Contributions of various fiber types and combinations in the resistance to cracking, stiffness, and toughness are recommended to enhance UHPC significantly with the optimal reinforcement. The report also explains some of the durability challenges which exist on chlorides, thermal cracking, etc., specifically under marine and aggressive environments. The experimental methodology included a broad range of mechanical tests and material selection processes along with microscopic analyses. Ultimately, the findings of the study indicate that UHPC presents a sustainable solution for infrastructure subjected to harsh conditions, thus extending its lifespan as well as reducing the maintenance time over a long period of time.

Keywords: Ultra High-performance Concrete, High Strength, Durability, Mechanical Properties, Flexural properties

ISDCP-135

A study on densification of Interfacial Transition Zone (ITZ) of concrete using Epoxy-Coated Aggregates in cement matrix

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Abstract

The Interfacial Transition Zone (ITZ) in concrete, often considered the weakest link due to its porous microstructure, plays a critical role in the mechanical properties and durability of concrete structures. The characteristics of the ITZ, particularly its microstructure and thickness, are significantly influenced by the type of aggregates used and the curing conditions. This study explores innovative techniques to enhance the ITZ, with a focus on the densification of this zone using epoxy-coated aggregates. While the effect of epoxy coatings on ITZ properties has not been extensively studied, similar aggregate modifications, such as the use of oil shale ash and basalt fibers, have shown promise in improving the bonding and densification of the ITZ. Additionally, the incorporation of nano-materials like nano-silica has demonstrated potential in reducing the permeability and improving the mechanical properties of concrete. This paper discusses the potential benefits of epoxy-coated aggregates in densifying the ITZ, enhancing concrete's performance, and improving its durability. Further research is needed to fully understand the effects of epoxy coatings on the ITZ and their potential applications in concrete production.

Keywords: ITZ Densification, Concrete Performance Enhancement, Aggregate Porosity

ISDCP-137

Lightweight Hemp Blocks as a Sustainable Alternative in Modern Construction: A Systematic Literature Review

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Abstract

This systematic literature review explores the potential of lightweight hemp blocks as a sustainable alternative in modern construction. Hemp blocks, made from the renewable and eco-friendly hemp plant, offer numerous benefits, including low thermal conductivity, excellent insulation properties, and reduced environmental impact compared to traditional building materials. The review examines the mechanical properties, durability, and performance of hemp blocks under various conditions, emphasizing their role in enhancing energy efficiency and reducing the carbon footprint of buildings. It also highlights advancements in manufacturing processes and the integration of hemp blocks in contemporary construction practices. Case studies and experimental research are analysed to validate the effectiveness of hemp blocks in real-world applications. The review concludes with recommendations for future research to address existing challenges and improve the adoption of hemp blocks in sustainable construction.

Keywords: Sustainable alternative material, Hemp blocks, Eco-friendly, Energy-efficient

ISDCP-138

Analysis of Load Carrying Capacity of RCC Columns by varying the Conventional Quantity of Cement Concrete

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Abstract

Hollow columns are widely used in bridge construction due to their lower seismic mass, which enhances the superstructure's safety compared to solid columns. This type of structural member can also be as economically viable as solid columns. This proposed project aims to study the design and analysis of the load-carrying capacity of columns with known cross-sectional areas and varying percentages of reinforcement for rectangular sections. It seeks to determine the relationship between the cross-sectional area, reinforcement percentage, and the load-carrying capacity of rectangular cross-sectional columns. In the proposed project as per the objectives the analysis of load carrying capacity of column for the struts and columns with square cross section was carried out by reducing the amount of concrete at Central portion in the circular shape. The behavior of columns has been a topic of research for many years. Despite this, the problem remains not fully understood, and design methods are primarily based on empirical formulas. The recent development of the limit state approach to design has focused on two key requirements: providing accurate information regarding structural behavior throughout the entire

range of loading up to the ultimate load, and offering a simple procedure to enable designers to analyze and assess this behavior. The work described in this report attempts to meet these requirements for reinforced concrete columns.

Keywords: Load-carrying Capacity, Reinforced concrete columns, Cross-sectional area, Concrete Reduction, Structural design optimization

ISDCP-055

Design and Development of Sandwich Panels Using Agricultural Waste for Sustainable Building Applications

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Abstract

As The Need for a sustainable solution increase, waste materials are gaining popularity in building applications to reduce the environmental impact. This study aims to utilize the corn husk (CH) and peanut husk (PH) with gypsum board and plywood board in a sandwich panel. where Polyurethane Foam (PU) is used as a binding material which consists of A (isocyanate) and B (polyol) with a mixing ratio of A: B at 1:1.2. CH is obtained as a residue from the production of coconut shells aggregate. The PU has been replaced with CH at 10,15 and 20%, to identify the optimum replacement level. Sandwich panels of dimension 20x20cm with a core thickness of 3 cm was prepared and tested to categorize their mechanical properties, thermal properties, durability properties characterization study. The results show that the PU replaced with 20 % of CH and PH has higher compression and flexural properties, owing as an optimum percentage. The inclusion of CH and PH in the PU reduces the cell size and yields a significant improvement in acoustic behavior up to a frequency of 1600 Hz. The regression model was analyzed with the experimental data and validated by the sustainable resources. The sandwich panel made in this study can be used as a building material providing better thermal and acoustic properties, also it helps in reducing waste disposal issues making it a sustainable panel.

Key words: Polyol, Polyurethane, Bio materials, Wood based panels.

TRACK 4 - ENVIRONMENTAL AND WATER RESOURCE

ISDCP-006

Meteorological and Hydrological analysis of drought in various regions of Karnataka

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Abstract

Droughts over India are prolonged period of abnormally low precipitation levels, resulting in water scarcity and significant depletion of soil moisture, surface water, and groundwater resources in the Country. Droughts can vary in duration, severity, and spatial extent, ranging from localized dry spells to widespread and long-lasting meteorological, hydrological, and agricultural drought events. The main parameters that trigger drought are low humidity and precipitation, high temperature, and wind. Drought conditions can have serious socio-economic, environmental, and public health impacts, affecting agriculture, water supply, energy production, ecosystems, and human well-being. For this reason, it is vital to monitor and determine drought condition by taking various measures. In this study, Meteorological drought assessment was carried out using Rainfall data which is taken from Indian Meteorological department (IMD) and Hydrological drought assessment is carried out using Reservoir Storage data taken from Central Water Commission (CWC). The Meteorological drought and Hydrological drought risk maps of Karnataka were prepared by integrating the various classes of drought. Finally, the drought risk map shows that about 12 districts of Karnataka such as Bidar, Kolar, Kalaburgi, Bengaluru rural, Tumkur, Mandya, Mysuru, Belagavi, Uttar Kannada, Dakshina Kannada, Bengaluru urban, Yadgir, were in Normal condition whose range lies between (-19 to +19%) and 19 districts such as Chikkaballapura, Udupi, Ramanagara, Chamarajanagara, Hassan, Raichur, Vijayapura, Davanagere, Dharwad, Chitradurga, Chikkamagaluru, Gadag, Shivamogga, Koppala, Kodagu, Haveri, Bagalkotte were in deficit condition whose range lies between (-20% to +20%).

Keywords: Drought, Meteorological drought, Hydrological drought, Rainfall Related Index, Reservoir Storage Index.

ISDCP-013

Sustainable Municipal Solid Waste Management in India by Bio methanation process

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Abstract

Due to the recent population expansion, fast industrialization, and urbanization, garbage generation has dramatically increased both globally and in India. This waste has huge potential for material and energy recovery. There are numerous waste-to-energy (WtE) technologies available, such as gasification, pyrolysis, incineration, biomethanation etc. that can offer dual benefit of combating the nuisance created by the waste as well support the energy needs of the country. Of these technologies, bio methanation is one of the most used technology to tap energy (gas/electricity) and procure compost (digestate).There

are numerous municipal solid waste based biomethanation plants operating in India. The aim is to identify the key challenges that the MSW based biomethanation plants are facing and provide possible recommendations for improving their performance and making them successful. The research outcome could be beneficial in helping regulatory authorities, plant operators, technology providers and other stakeholders in facilitating the conducive environment for the success of bio methanation as energy recovery facilities.

Keywords: Bio methanation plants; anaerobic digestion; biogas; energy; municipal solid waste management; waste to energy.

ISDCP- 018

Soft computing for comparative Analysis of Fuzzy Logic and ANN Models for Estimating Daily Reference Evapotranspiration with Limited Meteorological Inputs

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Abstract

This study explores the effectiveness of fuzzy logic in estimating daily reference evapotranspiration (ET_0) using simplified models with fewer parameters. Two fuzzy logic models were developed—one utilizing three input parameters and the other using six—to estimate ET_0 for grass. The models were tested with independent weather data from sites representing arid and humid climates. Estimated ET_0 values derived from the fuzzy models were compared against those obtained using the FAO Penman–Monteith (FAO-56 PM) method. A Simulink model was also constructed to verify the accuracy of the fuzzy logic controller's estimations. Additionally, artificial neural network (ANN) models were employed to predict daily ET_0 based on meteorological data from four stations: Bangalore, Bellary, Pattambi, and Solapur. Two ANN models were developed—one with six input variables and one output, and another with three input variables and one output. The performance of the ANN models was subsequently compared with results obtained via the FAO-56 PM method. The results demonstrate the potential of fuzzy logic and ANN models as viable alternatives to conventional ET_0 estimation methods, particularly in cases where input parameters are limited.

Keywords: Evapotranspiration (ET_0), Fuzzy Logic, Artificial Neural Network (ANN), FAO Penman–Monteith, Meteorological Data, Simulink, Reference ET Estimation.

ISDCP-023

Studies on Removal of Hexavalent Chromium using Novel Carbonaceous Cubic Spinel Ferrites as a Nano Adsorbent

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Abstract

This study intends to fix the Industrial wastewater using adsorption technology. The effectiveness of this method depends on the type of adsorbent used. In light of this genuineness, (Cu(0.5)Zn0.5Fe2O4) and (NiFe2O4) is acquired as an industrial level used as an adsorption material for destroying heavy metal Hexavalent chromium from an aqueous solution. The optimal conditions for effective removal of chromium from aqueous solutions were studied using batch adsorption experiments considering the effects of pH, adsorbent dosage, contact time and initial concentration of metal ions. The experimental results showed that when the initial target concentration of ionized heavy metals in aqueous solution was 100 ppm, (Cu(0.5)Zn0.5Fe2O4) and (NiFe2O4) adsorbent showed a removal efficiency of 99.96% and 97.47%. Adsorption isotherms were studied for Freundlich and Langmuir isotherms. Results showed that the Freundlich isotherm was more suitable and ensured that the adsorption was multilayer adsorption. Based on the experimentation results, it is apparent that by employing (Cu(0.5)Zn0.5Fe2O4) adsorbent Hexavalent chromium can be effectively eliminated from aqueous solution.

ISDCP-024

Explanatory Studies on Cost Effective Polymeric Nanocomposites for Removal of Fluoride Ions from Ground Water

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Abstract

This study addresses the urgent need to mitigate fluoride contamination in groundwater, a critical health concern, by employing adsorption technology. A zinc ferrite (ZnFe2O4) nanocomposite was synthesized as an efficient adsorbent for fluoride ion removal. Key operational parameters, including pH, adsorbent dosage, contact time, and initial fluoride ion concentration, were optimized through batch adsorption experiments. The findings revealed a high fluoride removal efficiency of up to 90% within 24 hours of contact time, with extended periods achieving even greater removal. Optimal performance was observed in a pH range of 2 to 7, with the nanocomposite exhibiting strong adsorption potential under slightly acidic conditions. Adsorption isotherm studies indicated that the Freundlich model best described the adsorption process, suggesting multilayer adsorption on heterogeneous surfaces. Kinetic analyses further validated the stability and efficiency of the nanocomposite. The material demonstrated adaptability across various conditions, highlighting its potential for scalable and sustainable application in fluoride removal. This research establishes the zinc ferrite nanocomposite as a promising, cost-effective adsorbent for water treatment. Its high efficiency, affordability, and compatibility with diverse environmental conditions provide a viable solution to mitigate fluoride contamination, particularly in regions heavily reliant on untreated groundwater.

Keywords: Adsorption; Adsorbent; Nanocomposites; Isotherms; Kinetic analysis

ISDCP-025

Advancements in solar panel frames

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Abstract

The study investigates the innovative use of recycled plastic boards in the design and implementation of two solar energy applications: awning solar panel windows operated by hydraulic pumps and solar panels integrated into car roof bases. The importance of this research lies in addressing the dual challenges of sustainability and energy efficiency, particularly in urban environments where space is limited and renewable energy sources are crucial for reducing carbon footprints Despite the growing interest in solar technologies, there remains a research gap concerning the integration of recycled materials in solar applications, particularly in enhancing structural performance and energy output. This project aims to develop practical, eco-friendly solar solutions that leverage recycled plastics to promote the circular economy while maximizing energy production. The process involves the fabrication of solar panel frames and awning windows from high-quality recycled plastic, followed by rigorous laboratory testing to assess their structural integrity and energy efficiency. The solar panels on car roofs are designed to operate effectively with minimal weight addition and improved aerodynamics. Hydraulic systems control the movement of the awning panels, optimizing sun exposure throughout the day. Key findings reveal that the recycled plastic solar panel windows maintain energy output comparable to conventional materials while offering superior insulation properties. Additionally, the solar panels mounted on car roofs show significant potential for powering vehicle systems, providing a sustainable energy source without compromising vehicle performance. The implications of this research are far-reaching, paving the way for broader adoption of recycled plastic in solar technology, enhancing energy efficiency in residential and automotive applications.

Keywords: Recycled Plastic Boards, Awning Solar Panels, Solar Car Roof Panels, Renewable Energy, Circular Economy, Sustainability, Solar Technology Integration, Automotive Energy Systems.

ISDCP-030

Water Pollution Modelling for Bangalore Metropolitan City using RS and GIS Applications

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Abstract

Water pollution is a critical environmental issue affecting the Bangalore Metropolitan Area, driven by rapid urbanization, industrialization, and population growth. This study leverages Remote Sensing (RS) and Geographic Information Systems (GIS) to model and analyse the spatial distribution and temporal trends of water pollution in Bangalore's surface and groundwater resources. By integrating satellite imagery, water quality data, and geospatial analysis, we identify key pollution sources, assess the extent of contamination, and monitor changes over time. The RS and GIS-based approach enables high resolution mapping of pollutants, including chemical, biological, and physical contaminants, providing a comprehensive understanding of the city's water quality dynamics. Our findings highlight critical pollution hotspots and offer actionable insights for urban planners, policymakers, and environmental

agencies to implement targeted interventions and sustainable water management practices. This research underscores the potential of advanced geospatial technologies in addressing urban water pollution challenges and promoting environmental sustainability in metropolitan areas., the physicochemical analysis of various physio-chemical parameters is carried out for assessment of ground water quality. Total of 12 samples were collected from 12 locations of Bangalore urban. Various physio-chemical parameters tested were pH, alkalinity, sulphate, nitrate, total hardness, dissolved oxygen, lead content, total solids, total dissolved solids, suspended solids, electrical conductivity, turbidity. For geo-referencing of study area, Toposheet No D43R12 (57G/12) of Bangalore urban – [between latitude (North of Equator) N 13˚0' to 13˚15' and between longitude (East of Meridian) E 077˚30' to 077˚45'] was used. The quality of groundwater is assessed in the study area based on water quality index model. The software's such as Google Earth Pro and ArcGIS v 10.5 were used for the generation of Study Area Map, spatial variation maps of various physio-chemical parameters and ground water quality The Water quality of HBR layout is good , Water quality of sagayapuram is excellent , Water quality of muneshwara nagar is good , Water quality of Vishwanath nagenahalli is good , Water quality of kacharakanahalli is very poor , Water quality of jakkuru-2 is good , Water quality of nagawara is good , water quality of horamavu is good , Water quality of thanisandra is poor , Water quality of kempegowda ward is good Water quality of byatarayanapura is good, Water quality of jakkuru is excellent.

Keywords: Wastewater, Reuse, water quality index physio-chemical parameters policymaker

ISDCP-041

Sustainable Reuse of Secondary Treated Sewage Water for Concrete Manufacturing: A Review

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Abstract

Due to urbanization around the Globe, Infrastructure Sector has got rapid revolution. The concrete manufacturing and concrete usage have increased in many folds as compared to previous decades. The manufacture of concrete requires huge quantity of water along with water required for human needs. This has increased the greatest stress on potable quality of water in Metropolitan Cities of Indian continent. In order to reduce the burden on potable water, Secondary Treated Waste Water is being proposed for concrete manufacture and curing etc. This paper reviews the physical, chemical effects of treated waste water and its effect on concrete when it is used for concrete manufacture mainly. The admixtures already used to increase the properties of concrete are reviewed. Various researches carried out study on usage of Secondary Treated Waste Water around the globe and discussed their advantages and disadvantages when adopted with different methods and methodologies are reviewed on this paper.

Keywords: Wastewater, Reuse, Secondary Treated, mechanical properties, Durability.

ISDCP-052

Optimizing Vermicomposting: A Comparative Study of Kitchen Waste Decomposition Using Conventional Methods Versus Organic Waste and Sewage Integration

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Abstract

The rapid increase in waste generation due to urbanization and industrialization has created significant challenges in environmental sustainability. This research explores the optimization of vermicomposting as a sustainable method for managing kitchen waste by comparing conventional approaches with methods integrating organic waste and sewage. The study utilized Eisenia fetida earthworms in a controlled setup with varying waste layer thicknesses (1 cm, 2 cm, 3 cm, and 3.5 cm) to evaluate compost quality over four weeks. Comprehensive analyses revealed that pH stabilized near 7.5, indicating suitable conditions for earthworm activity. Electrical conductivity increased from ~0.30 to ~0.36 dS/m, reflecting enhanced ion availability. Organic carbon content reduced from ~48% to ~40%, confirming efficient decomposition, while nitrogen levels rose from ~0.33% to ~0.41%, highlighting nutrient enrichment. Phosphorus and potassium contents improved, reaching ~0.25% and ~0.48%, respectively, with noticeable increases in calcium and magnesium levels that supported soil structure and fertility. The sewage-integrated method demonstrated superior nutrient release, faster compost maturity, and higher efficiency compared to conventional methods. This study emphasizes the potential of advanced vermicomposting as a scalable, eco-friendly waste management practice that aligns with sustainable development goals and promotes soil fertility enhancement.

Keywords: Vermicomposting, Kitchen Waste, Sewage Integration, Nutrient Enrichment, Sustainable Waste Management.

ISDCP-053

Air Quality Impact of Diwali in Bengaluru: A Comparative Study of Particulate and Gaseous Pollutants Before and After the Festival

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Abstract

This study evaluates the air quality impact of Diwali, a major Indian festival, on Bengaluru's urban environment. Diwali, marked by widespread firecracker usage, leads to short-term increases in particulate matter (PM10) and gaseous pollutants such as NO_2, SO_2, CO, and O_3. Using data from Karnataka State Pollution Control Board (KSPCB) monitoring stations, the study analyzed pollutant levels before and after Diwali over five years (2020–2024). Four monitoring stations were selected: Peenya Industrial Area (Asia's largest industrial hub), Bapuji Nagar, Jayanagar, and BTM Layout. These stations represent diverse urban zones, including residential, commercial, and industrial activities with moderate to high traffic densities. Pollutants were measured for one week before and after Diwali,

with data recorded at 15-minute intervals converted into hourly and daily averages. Statistical tools, including correlation and regression analysis via SPSS, were employed to identify patterns and relationships. The findings revealed consistent post-Diwali increases in pollutants. Strong correlations were observed between PM2.5 and PM10, NO and NO_2, and O_3 and NOx. PM10 showed the most significant rise, often surpassing the National Ambient Air Quality Standards (NAAQS) and WHO guidelines. For instance, in 2021, PM10 levels increased from 11–37 µg/m³ pre-Diwali to 55–69 µg/m³ post-Diwali. Similar trends were observed in subsequent years, with 2023 PM10 levels ranging from 17–86 µg/m³ pre-Diwali to 32–127 µg/m³ post-Diwali. While other pollutants, including NO, NO_2, NOx, NH_3, SO_2, CO, and O_3, remained within NAAQS limits, their consistent rise during and after Diwali indicates the significant influence of festival activities on air quality. PM10 levels, in particular, exceeded acceptable thresholds, raising health and environmental concerns. This study highlights the urgent need for interventions to mitigate the environmental impact of Diwali. Possible measures include promoting eco-friendly alternatives to firecrackers, stricter enforcement of pollution control regulations, and public awareness campaigns about the adverse effects of firecracker emissions.

Keywords: PM10, Gaseous Pollutants, Meteorology, Correlation, Wind speed

ISDCP-072

Colour Removal from Wastewater using Dried Tender Coconut Derived Activated Carbon

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Abstract

The waste water treatment sector currently faces significant challenges in addressing pollutants specific to certain industrial activities. Among many industrial pollutants, the treatment of colouring dyes used in the textile industries pose a major threat to the environment. While extensive research is focused on effectiveness of chemical coagulation and electro coagulation for removal of colour from industrial effluents, there is a growing interest in the application of chemical adsorption techniques. Activated carbon has been found to be an effective mode of removal of colours through the process of adsorption. On the other hand, several metropolitan cities face waste management crisis and challenge of handling and disposal of tender coconut waste is one of them. This study focuses on usage of dried tender coconut waste for preparation of activated carbon and then evaluates its effectiveness in removal of methylene blue and methyl orange colour samples in laboratory setup. The findings demonstrate that activated carbon obtained from dried tender coconut waste is a viable and effective material for colour removal. This provides a scope for utilization of this agricultural waste as a sustainable material for waste water treatment.

Keywords: colour removal; wastewater treatment; industrial dye; dried tender coconut waste.

ISDCP-083

Water Quality Index Development using Fuzzy Logic, A case study of the Karanja River of Karnataka, India

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Abstract

Determination of status of drinking water quality of a river is highly indeterminate; it is necessary to have a competent model to predict the status of water quality. The degree of certainty and uncertainness are one of the problems in the most commonly used methods for assessing the water quality. Fuzzy logic can successfully handle these problems. This paper presents the development of a new drinking water quality index based on fuzzy logic called the "fuzzy drinking water quality index" (FDWQI). Fuzzy drinking water quality index (FDWQI) is compared to the conventional water quality index (WQI). The new FDWQI provided reasonable correlations and results in comparison to the other reference indexes. Finally, the FDWQI could be used as a decision maker in the water management of Karanja River.

ISDCP-091

An Experimental Analysis for Turbidity Removal of Lake water using Natural Coagulant – A Sustainable Approach

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Abstract

The search for effective, accessible, and environmentally friendly water treatment solutions is crucial, especially in rural areas where conventional methods might not be feasible. Introducing a safe and easily applicable economic flocculant to replace traditional options like alum holds significant promise for enhancing water quality in such regions. This approach is particularly pertinent in areas where access to sophisticated water treatment infrastructure is limited or non-existent. Drawing from local resources adds another layer of sustainability and feasibility to the solution. Moringa oleifera and onion seeds, readily available in large quantities in many rural settings, emerge as viable candidates for natural coagulants. These seeds not only offer a cost-effective alternative but also boast properties conducive to effective water purification. Central to this research endeavour is determining the optimal dosage of these natural coagulants to achieve the highest turbidity removal efficiency. By conducting experiments using turbidity samples sourced from specific water bodies, such as Mallathalli lake and Somanahalli lake, this study aims to ascertain the most effective treatment approach. The results of these experiments provide valuable insights into the efficacy of Moringa oleifera and onion seed powder as natural coagulants. Achieving turbidity removal efficiencies of 83% and 89% respectively underscores the potential of these locally sourced materials in water treatment processes. Moreover, the study extends its analysis to the reduction of metals present in the treated water, highlighting the comprehensive benefits of employing natural coagulants.

Keywords: Moringa oleifera, onion seed, sustainable, turbidity

ISDCP-092

The Impact of Sewage Discharge on Groundwater Quality in the Vicinity of the Municipal Sewage Treatment Plant in HBR Layout, Hunnur, Bengaluru

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Abstract

In this project, the physicochemical analysis of various physio-chemical parameters is carried out for assessment of ground water quality. Total of 5 samples were collected from 5 locations of Bangalore urban area viz. HBR Layout at distance of 30,120,125,350,400 meters These 5 water samples were collected from sampling points whose connection was given to bore wells. Various physio-chemical parameters tested were pH, alkalinity, sulphate, nitrate, total hardness, dissolved oxygen, lead content, total solids, total dissolved solids, suspended solids, turbidity, AAS. For THE study area, [between latitude (North of Equated) 12.996362 between longitude (East of Meridian) 77.5766397 was used. The quality of groundwater is assessed in the study area based on water quality index model.

Keywords: Physio-chemical parameters, Sewage, Water quality index.

ISDCP-104

Vermicomposting - An eco-friendly approach towards Sustainable Agriculture

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Abstract

Vermicomposting is an eco-friendly and efficient method for converting organic waste into nutrient-rich compost using earthworms. This biological process leverages the natural digestive activity of earthworms, primarily *Eisenia fetida* and *Lumbricus rubellus*, to decompose organic matter, producing high-quality vermicast that enhances soil fertility and plant growth. This study examines the key factors influencing vermicomposting, including substrate composition, moisture content, temperature, and earthworm species, to optimize the process. The environmental benefits, such as waste reduction, reduced greenhouse gas emissions, and improved soil health, are highlighted, along with its potential for large-scale applications in agriculture and waste management. Challenges related to scalability, pest control, and process standardization is also addressed. The findings underscore vermicomposting as a sustainable approach for organic waste recycling, promoting circular economy practices and contributing to environmental conservation.

ISDCP-122

Solid Waste Management in Chikkaballapura city: Challenges, Opportunities, and Sustainable Solutions

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Abstract
Solid Waste Management (SWM) presents a significant challenge for Urban Local Bodies (ULBs) in India. This study examines the SWM profile of Chikkaballapura city, focusing on its current status, challenges, and potential future opportunities. A comprehensive city-wide survey was conducted across all wards under the Chikkaballapura City Municipal Council (CCMC) to collect data on households, commercial establishments, and bulk waste generators. A weighment study was performed to estimate the average waste generation for each category and the city's total waste generation. Furthermore, the composition of waste was determined by sorting waste into material types and weighing each type. The formal and informal waste collection systems within the city were analysed. The findings reveal that Chikkaballapura generates approximately 30 tons of waste per day (TPD), excluding drain waste and construction and demolition (C&D) waste. Approximately 7 tons of waste is currently managed through livestock farms and scrap shops informally. Households emerged as the largest waste contributors, accounting for 60% of the total waste generated. The waste composition includes 57% compostable and 43% non-compostable material. The paper concludes by offering actionable recommendations to establish sustainable waste management practices and foster a circular economy, thereby enhancing SWM in Chikkaballapura city.
Keywords: Chikkaballapura, solid waste management, circular economy, waste composition, informal sector.

ISDCP-134

Identification of Weathered and Fractured Zones using Geophysical Method

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Abstract

The invention pertains to a method for the identification of weathered and fractured zones in subsurface layers using the Electromagnetic (EM) method, aimed at enhancing the planning and execution of civil engineering projects at Rajarajeshwari Nagar. The method involves the deployment of EM equipment to measure variations in subsurface electrical conductivity, which are indicative of geological anomalies such as weathered or fractured zones. The procedure includes site selection, equipment calibration, systematic data collection along predefined grids, and subsequent data processing to generate detailed subsurface conductivity maps. These maps help identify areas of compromised subsurface integrity, which are critical for ensuring the safety and stability of structures like buildings, bridges, and roads. The EM method is non-invasive, cost effective, and efficient, offering rapid coverage of large areas with minimal environmental disruption. The invention provides a reliable tool for early detection of subsurface risks, thereby supporting informed decision-making in geotechnical and civil engineering design.
Keywords: Weathered Zones, Fractured Zones, Electromagnetic (EM) Method, Subsurface investigation

ISDCP-136

Assessment Of Treated Wastewater for Agriculture Purpose in Kolar District

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Abstract

The increasing demand for freshwater resources and rapid urbanization have highlighted the need for alternative water sources in agriculture. Kolar district, located in the semi-arid region of Karnataka, India, faces acute water scarcity and declining groundwater levels, necessitating sustainable water management practices. This study evaluates the feasibility of using treated wastewater for agricultural purposes in Kolar district, focusing on its quality, environmental impact, and economic viability. Samples of treated wastewater from local treatment plants were analysed for key parameters, including pH, electrical conductivity, biological oxygen demand (BOD), chemical oxygen demand (COD), and the presence of heavy metals and nutrients. The results were compared with national and international irrigation water quality standards. The study also investigated the effects of treated wastewater on soil properties and crop yields in experimental plots. Preliminary findings indicate that treated wastewater in the district contains sufficient nutrients, such as nitrogen and phosphorus, beneficial for crop growth. However, concerns regarding salinity, microbial contamination, and heavy metal accumulation were identified, which may pose risks to soil health and human safety if not properly managed. The study emphasizes the importance of advanced treatment technologies, continuous monitoring, and appropriate management practices to mitigate potential risks. The research concludes that, with proper treatment and management, treated wastewater can serve as a sustainable alternative for irrigation, reducing reliance on groundwater and improving agricultural productivity in water-scarce regions like Kolar. It calls for integrated water management policies and farmer awareness programs to promote the safe and effective use of treated wastewater in agriculture.

Keywords: ph, phosphours, potassium, nirogen, kolar

ISDCP-016

Microplastic degradation by Electrocoagulation process as a Review Article

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Abstract

With the gradual increase of microplastics in the water environment, it is imperative to understand the removal characteristics of microplastics in the current treatment process. Electrocoagulation (EC) is an effective water treatment technology. The purpose of this study is to investigate the removal performance, mechanism and influencing factors of microplastics in wastewater treatment by EC. The impacts of wastewater properties, including initial pH, electrolyte concentration, applied voltage density, anode materials, microplastic type and microplastic concentrations, on the removal efficiency of microplastics by EC were systematically investigated. The findings showed that the aluminium anode was better than the iron anode in the removal of microplastics, and the removal rate of was above 80% in all experiments, which indicates that aluminium anode EC is an effective method to remove microplastics in wastewater, other studies also we have seen The need for better microplastic removal from wastewater streams is clear, to prevent potential harm the microplastic may cause to the marine

life. This paper aims to investigate the efficacy of electrocoagulation (EC), a well-known and established process, in the unexplored context of microplastic removal from wastewater streams. This premise was investigated using artificial wastewater containing polyethene microfibers of different concentrations. The wastewater was then tested in a 1 L stirred-tank batch reactor. The effects of the wastewater characteristics (initial pH, NaCl concentration, and current density) on removal efficiency were studied. Microbead removal efficiencies over 90% were observed in all experiments, thus suggesting that EC is an effective method of removing microplastic contaminants from wastewater streams.

Keywords: Electrocoagulation, Microplastic, Batch Reactor, Electrodes (Al&Fe), Microfibers

ISDCP-078

Desalination using reverse osmosis scope of power generation and the potential benefits of estuarine water comparted to sea water

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Abstract

Concrete structures' performance and longevity are significantly impacted by the carbonation process, especially in harsh environmental conditions. This study examines how concrete samples' mechanical characteristics and carbonation are affected by exposure to synthetic acid rain. To replicate long-term exposure under accelerated settings, concrete specimens were exposed to synthetic acid rain for a range of times: 0 hours (control), 20 hours, 40 hours, and 80 hours. The aim of the experimental investigation was to determine how exposure to artificial acid rain affected mechanical characteristics such as Split tensile strength, flexural strength, and compressive strength. To understand the mechanism of chemical degradation in acidic environments, the carbonation depth was also evaluated. The findings show a strong relationship between the amount of time exposed to acid rain and the decline in mechanical performance, with carbonation speeding up with exposure duration. Significantly, the samples exposed for 80 hours showed the greatest carbonation depth and the greatest reduction in compressive strength, showing the negative consequences of extended exposure to acid rain. These results highlight the need for better materials and preventative measures to lessen the effects of acid rain on infrastructure and offer important new insights into the durability issues concrete faces in acidic settings. In order to ensure long-term sustainability and resilience, this research helps design more resilient concrete mixtures and creative protective coatings for buildings exposed to acidic environments.

Keywords: chemical degradation concrete mixtures protective coatings compressive strength

ISDCP-043

Decreasing Trend of Rainfall by the Enhancement of Human Activities in the Southern Coastal Karnataka

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Abstract

The west coast of India, in particular, the Karnataka Coast, which is adjoining the Western Ghats is the region of high rainfall ranging from 300 to 800 cm/yr. The southern part of the Karnataka Coast is the hot-spot of industrialization as well as rapid urban growth, liberating anthropogenic contaminants, such as increasing the concentrations of particulate matter, oxides of sulphur and nitrogen to the atmosphere. About 85% of the annual rainfall received during the summer season (June, July, August, and September). In this study, an effort is made to understand the impact of the atmosphere on the monsoon rainfall. The rainfall data along with land-use and land cover of the study region over the past four decades indicate an inverse relationship, implying the impact of human activity. Based on statistical correlations and regressions, the amount of the decrease in rainfall is estimated to be around 5% over the long-term mean of rainfall, suggesting the human-centric regions seem to be affected. The most probable sources of contaminants in the atmosphere that hinder the rainfall is from the biomass burning and automobile emission, as they liberate a lot of heat (infrared radiation), black carbon, unburnt hydrocarbons and oxides of nitrogen, sulphur and carbon. The steady increase in a number of atmospheres contaminating industries, escalating automobile vehicles at alarming rates and changes in the land-use pattern liberate a lot of absorbing aerosols and gaseous contaminants in the atmosphere over the study area. Though this finding appears to be insignificant, this study suggests the policy makers to mitigate pollution as well as to construct water conservation structures to meet the demand of water especially during the winter and spring seasons.

Keywords: Monsoon rainfall, coastal Karnataka, human impact

TRACK 5 – CONSTRUCTION MANAGEMENT

ISDCP-021

Towards Sustainable Construction: A Systematic Literature Review on Integrating ESG Principles and SDGs in Reducing Carbon Footprint through Reuse of Construction Demolition Waste

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Abstract

This systematic literature review (SLR) examines the integration of Environmental, Social, and Governance (ESG) principles and the Sustainable Development Goals (SDGs) in reducing the carbon footprint through the reuse of construction demolition waste. As the construction industry significantly contributes to environmental degradation, effective waste management strategies are essential for promoting sustainability. This review identifies existing frameworks and practices that align ESG criteria with waste management, highlighting their potential to achieve specific SDGs, such as sustainable cities (SDG 11) and responsible consumption (SDG 12). Through a comprehensive analysis of selected studies, this paper synthesizes findings on the impacts of demolition waste reuse on carbon emissions and assesses barriers to implementation. Key insights reveal the necessity for cross-disciplinary approaches that incorporate stakeholder engagement and innovative technologies to enhance the efficacy of waste management strategies. The review concludes with recommendations for integrating ESG principles into construction practices, addressing identified research gaps, and suggesting future research directions to foster sustainable development in the construction sector.

Keywords: ESG, Sustainable Development Goals, carbon footprint, construction demolition waste, waste management, sustainability, stakeholder engagement.

ISDCP-037

Light Weight Hemp Blocks as A Sustainable Alternative in Modern Construction

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Abstract

The growing need for sustainable building materials in modern construction has led to increased interest in innovative alternatives to traditional concrete and brick. Among these, lightweight hemp blocks have emerged as a promising material, offering numerous environmental and practical benefits. Hemp, a fast-growing, renewable plant, can be processed into blocks that are lightweight, strong, and highly insulating, making them an ideal option for eco-friendly construction. This study explores the potential of hemp blocks as a sustainable alternative, analysing their key advantages such as reduced carbon footprint, energy efficiency, and minimal environmental impact. The use of hemp in construction also supports the circular economy by utilizing a biodegradable and recyclable material. Furthermore, hemp blocks have superior thermal and acoustic properties, contributing to healthier indoor environments. The advantages of integrating hemp blocks into modern building practices, demonstrates their viability in creating energy-efficient, cost-effective, and sustainable structures. Challenges such as regulatory acceptance, cost of production, and scalability are also addressed, with a focus on ongoing research and

development to optimize hemp block performance. The study concludes that hemp blocks represent a valuable innovation in the shift towards more sustainable construction practices, offering an eco-conscious solution to meet the demands of a growing global population.

Keywords: indoor environments hemp blocks biodegradable and recyclable material

ISDCP-054

Strategies to Reduce Embodied Energy for Sustainable Construction Practices

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Abstract

The construction industry significantly contributes to global carbon emissions, with embodied energy consumed during material production, transportation, and construction being a critical factor. This project, titled "Strategies to Reduce Embodied Energy for Sustainable Construction Practices," aims to address this challenge by developing practical solutions to minimize embodied energy in building projects. The first objective involves analysing current embodied energy trends in an existing building, identifying high-impact materials and processes through detailed life cycle assessments. Based on these insights, innovative strategies will be developed, emphasizing the use of alternative materials such as recycled or low-carbon options, as well as advanced construction techniques. These strategies aim to reduce embodied energy without compromising structural performance or economic feasibility. The project also seeks to propose actionable measures that can be integrated into the construction workflow from its initiation. By creating guidelines and awareness campaigns, it aims to educate stakeholders and promote the adoption of sustainable practices. Expected outcomes include a comprehensive understanding of embodied energy trends, validated strategies for energy reduction, and increased industry awareness. These results will contribute to the broader goal of transitioning towards greener construction practices, thereby supporting global sustainability objectives.

Keywords: Embodied Energy, Sustainable Construction, Alternative Building Materials, Energy Reduction Strategies

ISDCP-058

Evaluation of Autonomous Healing Efficiency in Reinforced Concrete Beams

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Abstract

Concrete is the most widely used construction material due to its strength, versatility, and affordability, but it is prone to cracking over time. These cracks allow water, chemicals, and other corrosive agents to infiltrate the structure, compromising its durability and structural integrity. Self-healing concrete offers an innovative solution to this issue by enabling automatic crack repair, thereby enhancing concrete longevity and reducing the need for costly repairs. This study explores the use of two distinct healing agents embedded in concrete: sodium silicate in glass tubes and Bacillus megaterium in acrylic

tubes. Sodium Silicate in Glass Tubes: Sodium silicate, commonly known as water glass, is used in self-healing concrete for its ability to react with calcium hydroxide, a byproduct of cement hydration. When cracks form in the concrete, water entering these cracks activates the sodium silicate. Encapsulated in fragile glass tubes, the sodium silicate is released upon tube breakage due to cracking. It reacts with the calcium hydroxide present in the concrete, forming calcium- silicate hydrate (C-S-H) gel that fills and seals the cracks. The C-S-H gel hardens over time, blocking further water infiltration and restoring the concrete's structural integrity. Bacillus Megaterium in Acrylic Tubes: Bacillus megaterium is a non-pathogenic, spore- forming bacterium capable of precipitating calcium carbonate ($Caco_3$). Embedded in acrylic tubes to shield it from the concrete's harsh environment, the bacterium remains dormant until water triggers its activation. Upon activation, Bacillus megaterium consumes calcium lactate, a nutrient source also embedded in the acrylic tube, and produces calcium carbonate, which fills cracks in the concrete. The calcium carbonate acts as a natural sealant, improving the durability of the concrete by filling voids and strengthening weakened areas. The use of dual healing agents provides a more comprehensive self-healing mechanism. Sodium silicate offers rapid sealing of smaller cracks, preventing the ingress of water and reducing permeability, while Bacillus megaterium contributes additional durability by precipitating calcium carbonate within larger or recurring cracks. The combination of these agents is anticipated to improve the concrete's resilience, extend structural lifespan, and lower maintenance costs. This approach holds great potential for critical infrastructure such as bridges, tunnels, and water-containment structures, where long-term durability is essential. Through this dual-agent self-healing strategy, this study aims to demonstrate a more efficient, cost-effective, and sustainable approach to enhancing concrete's performance and lifespan in real-world applications.

Keywords: Self-healing concrete, Sodium silicate, Bacillus megaterium, Crack repair, Calcium carbonate precipitation

ISDCP-062

Investigating the Rate of Crack Healing In Beams using Bacterial Concrete

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Abstract

Crack formation in concrete structures is a persistent issue that can compromise structural integrity and durability. Traditional repair methods are often labor-intensive, costly, and temporary. Recently, bacterial concrete, which utilizes calcite-precipitating bacteria to self-heal cracks, has emerged as a promising alternative. This study investigates the rate and effectiveness of crack healing in concrete beams using bacterial concrete. By embedding Bacillus species bacteria and nutrients within the concrete matrix, we observe the crack-filling capacity over time under varying environmental conditions. The experiment evaluates crack width reduction, healing speed, and structural resilience compared to conventional concrete. Results show that bacterial concrete significantly enhances self-healing properties, offering a sustainable, efficient solution for infrastructure longevity and reduced maintenance costs. This research contributes to advancing self-healing materials in civil engineering and highlights the potential of bacterial concrete to revolutionize sustainable construction practices.

Keywords: Bacterial Concrete, Bacillus Species, Crack Width Reduction, Healing Speed, and Concrete Beam Testing

ISDCP-142

Design and Devlopment of Interlocking Blocks

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Abstract

Interlocking blocks have become a popular choice in the construction industry due to their numerous benefits, including cost-effectiveness, ease of assembly and sustainability. This research focuses on the design and development of interlocking blocks, comparing them to similar construction system used in building projects. The study investigates the various types of interlocking block designs, materials, and production methods, examining their efficiency and suitability for different construction needs. It also reviews the environmental advantages of interlocking blocks, such as reduced construction waste, lower carbon footprint, and energy efficient performance. By analyzing similar projects, the study highlights the strengths and weaknesses of existing interlocking block technologies, exploring how these blocks compare to traditional brick and mortar or other modern building system. The findings provide valuable insights into how interlocking blocks system can be improved in terms of design, material choice, and manufacturing processes. Ultimately, the study aims to suggest ways to optimize the use of interlocking blocks in both residential and commercial construction, helping to make building more affordable, energy- efficient, and environmentally friendly.

Keywords: environmental advantages of interlocking blocks sustainability block technologies

ISDCP-145

Sustainable Geopolymers: A Comprehensive Review of Red Mud and Bio-Incineration Waste based mortar in Construction Applications

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Abstract

The depletion of natural resources and environmental degradation due to conventional construction practices have intensified the search for sustainable alternatives. Geopolymers, inorganic binders synthesized through the reaction of aluminosilicate precursors with alkaline activators, have emerged as a promising substitute for traditional cementitious materials. This review examines the potential of red mud, a by-product of the aluminum industry, and bio- incineration waste, a residue from biomass combustion, as precursors for geopolymer synthesis. Both materials are abundant and possess high alumina and silica content, making them suitable for geopolymerization. The study delves into the chemistry of geopolymer synthesis, material properties, and a wide range of applications, including structural components, precast elements, and fire-resistant materials. The environmental benefits, such as waste valorization, carbon footprint reduction, and resource conservation, are critically analyzed alongside economic feasibility. Challenges such as material variability, alkalinity management, and the need for standardization are discussed, with a focus on recent innovations, including hybrid

formulations and advanced characterization techniques. By addressing these barriers, red mud and bio-incineration waste-based geopolymers have the potential to transform the construction industry, paving the way for environmentally friendly and high-performance building materials. This review highlights their role in promoting a circular economy and sustainable development in the construction sector.

Keywords: Geopolymers, Alkaline activators, Sustainable construction, Geopolymerization, Carbon footprint reduction.

ISDCP-150

PCM based Lime Mortar to Enhance Energy Efficiency Of Building by Adding Light Weight Aggregate

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Abstract

The energy efficiency of the building can be improved by adding PCM in it for energy storage. The mechanical and thermal study for the lime mortar mixes is studied. The different mixes are LM, LM-PCM, LM-LWA and LM-LWA-PCM. The LWA is added about 10% of sand and PCM is added about 5% to the weight of lime. The PCM is impregnated in the form of Sheet in the mix. The thermal properties are studied for these mixes to know the thermal comfort of the building which can be built using these construction materials. The thermal comfort is studied for the climatic condition of the tropical regions. When the temperature applied to the samples in the laboratory at room temperature the thermal conductivity and specific heat of the samples are studied. A separate test for PCM is made to know the melting and freezing of PCM. The density and compressive strength of the samples are also studied. By incorporating PCM in lime mortar the energy storage is increased with decease in strength of the mortar. By impregnating PCM in LM-LWA, the thermal comfort is also increased with increase in strength of the LM-LWA. So that the energy can be maintained in the building.

Keywords: climatic condition thermal conductivity and PCM in LM-LWA

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About the Institution

Dayananda Sagar College of Engineering, established in 1979 under the aegis of the Mahatma Gandhi Vidya Peetha Trust, stands as one of India's leading institutions for technical education. Approved by the All India Council for Technical Education and affiliated with Visvesvaraya Technological University, DSCE has built a strong reputation for its academic rigor, innovative teaching methods, and research excellence. The college offers a comprehensive range of programs, including 20 undergraduate and 6 postgraduate courses across diverse engineering disciplines, catering to the evolving demands of the industry and society. Additionally, DSCE hosts 18 VTU-approved research centers, fostering advanced research and providing opportunities for Ph.D. studies. Situated on a sprawling green campus, DSCE is equipped with cutting-edge infrastructure that includes state-of-the-art laboratories designed to facilitate hands-on learning and research. The campus features both a Central Library and a Digital Library that serve as invaluable resources for students and faculty alike. These libraries boast a vast repository of knowledge, complemented by modern facilities that support academic excellence.
The faculty at DSCE are highly dedicated and exemplify professional integrity, ensuring personalized attention and fostering the professional growth of students. Their commitment to academics is complemented by a strong focus on research, as evidenced by numerous sponsored R&D projects from prestigious organizations such as the Department of Science & Technology, Indian Space Research Organization, Defense Research & Development organizations, and AICTE. This robust research orientation positions DSCE as a hub for innovation and academic inquiry. DSCE's quality and relevance in technical education are further validated by its accreditations and rankings. The college has been accredited by NAAC with an 'A' grade and 12 of its undergraduate programs have received accreditation from the NBA, underscoring its commitment to delivering high-quality education. Its prominence is also reflected in various national rankings. As per the NIRF 2024 rankings released by the Ministry of Education, DSCE is placed in the 51-100 rank band for the Innovation Category and the 201-300 rank band among top engineering colleges in India. Furthermore, the institution has been ranked 103rd Nationally and 9th in Bengaluru in the India Today-MDRA 2024 Best College Survey. In The Week's Best College Ranking Survey 2024, DSCE secured the 130th position nationally and ranked 8th in Bengaluru. Additionally, Careers 360 awarded DSCE an impressive AAAA+ rating, reinforcing its standing among India's top engineering institutions.
DSCE's focus on holistic development, cutting-edge infrastructure, research excellence, and high-quality education continues to position it as a premier choice for aspiring engineers and researchers. With a vision of fostering innovation and academic brilliance, the college is dedicated to shaping future leaders and contributing significantly to the field of engineering and technology.

About the Department

The Civil Engineering Department at Dayananda Sagar College of Engineering (DSCE), Bengaluru, is renowned for its comprehensive curriculum and state-of-the-art facilities. Established in 1979, the department aims to produce highly skilled and knowledgeable civil engineers. The curriculum includes core subjects such as structural engineering, geotechnical engineering, transportation engineering, environmental engineering, and water resources engineering.

The department has well-equipped laboratories, including those for basic material testing, surveying, concrete technology, soil mechanics and environmental engineering. Additionally, it has advanced software and tools for design and analysis, facilitating practical learning and research. The faculty comprisesvexperienced Professors and industry experts dedicated to imparting quality education and fostering innovation.

DSCE's Civil Engineering Department emphasizes hands-on training through field trips, internships, workshops, and projects. It maintains strong industry connections, providing students with ample opportunities for internships and placements in leading companies. The department also encourages research and development, with students and faculty regularly contributing to national and international journals and conferences.

Overall, the Civil Engineering Department at DSCE is committed to developing proficient engineers who can address contemporary challenges and
contribute to sustainable infrastructure development.

Vision of the Department

To emerge into a center of excellence providing globally competent engineers oriented towards research, innovation and sustainable development of the society

Mission of the Department

- Disseminate quality education and provide a research environment.
- Foster experimental and professional skills.
- Inculcate the importance of ethics and sustainability.

Courses offered
- Bachelor of Engineering (B.E.) in Civil Engineering
- Master of Technology in Structural Engineering
- Master of Technology in Highway Technology
- PhD in Civil Engineering (Under VTU)

Dayananda Sagar College of Engineering
An Autonomous Institute, affiliated to VTU, approved by AICTE & UGC and accredited by NAAC with 'A' grade
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