NAAC GRADE A+
ACCREDITED UNIVERSITY

REVA UNIVERSITY
Bengaluru, India

8th International Conference on Sustainable Materials & Practices for Advanced Research in Civil Engineering (SMPARCE - 2024) (Hybrid Mode)

Organised by

School of Civil Engineering

12th and 13th July, 2024

Rukmini Educational
Charitable Trust

www.reva.edu.in

Table of Contents

About REVA University

REVA University is a State Private University established in Karnataka State under the Government of Karnataka Act No. 13 in the year 2012 in Bengaluru, the IT capital of India. The University is recognised by the University Grants Commission (UGC) and is approved by the AICTE (All India Council for Technical Education). REVA University prides itself in contributing to every student's holistic development. The University currently offers 38 fulltime Under Graduate Programmes, 33 full-time Post Graduate programmes, 20 PhD programmes, and certification and diploma programmes. The University offers programmes in Engineering, Architecture, Science and Technology, Commerce, Management Studies, Law, Arts & Humanities, and Performing Arts. Courses are offered in Certificate/Diploma and Post Graduate Diploma too. REVA University facilitates research leading to a Doctoral Degree in all disciplines. The programmes offered by REVA University are well-planned and designed based on methodical analysis and research with emphasis on knowledge assimilation, practical applications, hands-on training, global and industrial relevance, and their social significance.

About the School of Civil Engineering

The School of Civil Engineering is headed by highly experienced Professor and is supported by well qualified faculty members. The school has state-of-the-art classrooms and well-equipped laboratories. It offers B.Tech. in Civil Engineering and M.Tech. programs in Computer Aided Structural Engineering, Transportation Engineering & Management and Construction Technology & Management, in addition to one-year certification programmes in various streams. The school also has research program leading to doctoral degree. The curriculum of both graduate and postgraduate degree programs have been designed to bridge the gap between industry academia and hence they are industry application oriented. Civil Engineering teaching was limited to planning, analysis, design and execution of different types of infrastructure like buildings, roads, bridges, dams and power plants. However currently, due to increase of techno - logical sophistication and demand for higher living standards geared up by economic growth and concerns about environmental impact has changed the scope of Civil Engineering. The REVA University would like to offer Civil Engineering Programme to produce quality engineers who are effective and efficient in problem solving and providing economical and sustainable infrastructural solutions.

Vision

REVA University aspires to become an innovative university by developing excellent human resources with leadership qualities, ethical and moral values, research culture and innovative skills through higher education of global standard.

Mission

- To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers.
- To provide a student-centric learning environment through innovative pedagogy and education reforms.
- To encourage research and entrepreneurship through collaborations and extension activities
- To promote industry-institute partnerships and share knowledge for innovation and development.
- To organize society development programs for knowledge enhancement in thrust areas.
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

Conference Overview

The conference theme of "Sustainable Materials and Practices for Advanced Research in Civil Engineering" (SMPARCE – 2024) encapsulates the essence of innovation and responsibility within the realm of infrastructure development. It signifies a dedicated pursuit towards harmonizing human progress with environmental stewardship. Throughout the conference, scholars, practitioners, and policymakers converge to explore the integration of eco-conscious materials and methodologies into the fabric of civil engineering. Themes of resilience, efficiency, and longevity permeate discussions, as participants delve into the forefront of sustainable design and construction practices. Embracing interdisciplinary collaboration, the conference fosters a fertile ground for the exchange of ideas, strategies, and best practices aimed at mitigating environmental impact while enhancing the durability and functionality of civil infrastructure. Through conference presentations, and collaborative endeavours, attendees engage in a collective journey towards shaping a more sustainable and resilient built environment for future generations. We hope that our Conference will offer a unique opportunity for interesting and fruitful interactions to all participants, providing them with memorable and pleasant experiences.

Research Areas

Materials, Structures and Construction

- Advances in Science and Technology of Cement, Admixtures and Concrete.
- Concrete with Recycled Materials.
- Sustainability of Concrete and Durability of Concrete.
- Structural Health Monitoring.

Geotechnical, Geosynthetic and Geotextile Applications

- Soil Stabilization Material and Methods.
- Reinforced Earth Structures and Materials.
- Ground Investigation and Ground Risk Management.
- Ground Improvement Techniques.

Water Resources and Environmental Pollution

- Water Resources Planning and Management.
- Ground Water Modeling & Recharge.
- Water and Wastewater Treatment.
- Municipal Solid Waste Characterization and Management.

Transportation, Surveying, & Construction Management

- Material Characterization.
- Pavement Materials Evaluation.
- Application of Remote Sensing and GIS.
- Time and Cost Optimization in Project Management
- Multidisciplinary Perspectives in Sustainable Infrastructure

Message from Pro Vice Chancellor

Research and innovation is the need of higher education system in India that focus on multiple dimensions of activities such as quality publications, research funding, patents and consultancy. Outcomes of research acts as the torch bearer in developing the prototypes, technology transfers, real-time products that induces start-up culture in the university system.

REVA University always initiates research avenues and brings visibility to reach better milestones. As part of this initiative, School of Civil Engineering organized an **"International conference on Sustainable Materials and Practices for Advanced Research in Civil Engineering" (SMPARCE – 2024),** which attracted good number of quality research articles from researchers and scientists across the regions. This conference provides a platform for researchers, scientists, academicians, industry people and students on common forum for exchange of various research ideas.

I wish all research scholars, faculty and students of School of Civil Engineering a grand success of SMPARCE-2024.

Dr Rajashekhar C Biradar

Pro Vice Chancellor (Engineering) and Dean

REVA University

Bengaluru

Message from Registrar

It is great to know that the School of Civil Engineering is organizing the "8th International Conference on Sustainable Materials & Practices for Advanced Research in Civil Engineering" (SMPARCE-2024), which will be held on the 12th and 13th of July, 2024. This conference establishes its significance community of professionals, academicians, and research scholars. The enthusiastic response from participants, eager to participate and share their insights has been tremendously encouraging. As a vibrant forum, the conference will allow practitioners, students, and academicians to delve into discussions on integrating eco-conscious materials and sustainability methods into the fabric of Civil Engineering. With themes centred around resilience, efficiency, and longevity, the conference aims to explore the Sustainable materials & practices for advanced research.

I would like to congratulate to the Director of the School of Civil Engineering and the faculty of School for organising this conference and also would like to thank all the delegates for the participation and intellectual contribution.

Dr. K. S. Narayana Swamy

Registrar (I/C),

REVA University

Bengaluru

Director's Message

Dear Distinguished Speakers, Respected Colleagues, and Attendees,

Welcome to the "8th International Conference on Sustainable Materials & Practices for Advanced Research in Civil Engineering" (SMPARCE-2024) proudly hosted by the School of Civil Engineering at REVA University. As we gather here in the heart of Bengaluru, a city renowned for its blend of rich history and dynamic modernity, we are reminded of the critical role civil engineering plays in shaping both our physical and societal landscapes. This conference is not just a meeting of minds, but a convergence of vision and ambition aimed at defining the future of our discipline.

The School of Civil Engineering at REVA University has long stood as a beacon of academic excellence and innovation. With a dedicated faculty and a curriculum that blends rigorous academic theory with practical expertise, we are committed to moulding the next generation of civil engineers who are not only skilled in technology but are also thoughtful stewards of sustainable development.

In the realm of civil engineering, the challenges we face are as diverse as they are complex. From the need for sustainable urban planning to the imperatives of climate resilience, our work has never been more crucial. It is imperative, therefore, that we come together to explore new horizons, exchange cutting-edge insights, and collectively address the pressing issues of our time. This conference serves as a platform for such intellectual discourse, providing a venue where experts, practitioners, and students from around the globe share their expertise, latest research findings, and practical experiences.

Our sessions and discussions over the next two days will cover a broad spectrum of topics within civil engineering. We will delve deeply into a fertile ground for the exchange of ideas, strategies, and best practices aimed at mitigating environmental impact while enhancing the durability and functionality of civil infrastructure.

The conference also underscores our commitment to being at the forefront of technological, environmental, and societal advancements. Our aim is not only to identify the challenges that lie ahead but also to forge innovative solutions that can shape the future of civil engineering.

I am especially thankful to keynote speakers for their invaluable insights into the challenges and innovations within our field.

I encourage all participants to actively engage in the rich discussions, thought-provoking presentations, and interactive workshops throughout the conference. Together, let us inspire and be inspired as we contribute to the sustainable development of our communities and the world at large.

Warm regards,
Dr. Bhavana B,
Chairperson, SMPARCE-2024
Associate Professor & Director, School of Civil Engineering,
REVA University, India.

Convener's Message

Dear Esteemed Colleagues and Participants,

Welcome to the conference on "Sustainable Materials and Practices for Advanced Research in Civil Engineering." It is with great enthusiasm and pride that we gather here to explore and advance the frontiers of sustainability in our field.

In the face of unprecedented environmental challenges, the need for sustainable solutions in civil engineering has never been more critical. Our theme this year underscores the importance of integrating eco-friendly materials and practices into our research and development endeavours. This conference serves as a pivotal platform for sharing innovative ideas, pioneering research, and practical strategies that align with our collective goal of creating a resilient and sustainable built environment.

We are honoured to host a diverse array of experts, practitioners, and scholars from around the globe, each bringing unique perspectives and insights. Through our collaborative efforts, we aim to foster an environment where groundbreaking research can flourish, and sustainable practices can be effectively implemented. The sessions planned are designed to provoke thought, inspire innovation, and encourage actionable solutions.

I extend my heartfelt thanks to all our speakers, participants, and organizers for their contributions and dedication to this cause. Your commitment to advancing sustainable civil engineering practices is the driving force behind this conference's success.

Together, let us embark on this journey of discovery, collaboration, and transformation. May the knowledge and connections we cultivate here propel us towards a future where civil engineering not only meets the demands of modern society but also preserves and enhances our natural world for generations to come.

Warm regards,
Dr. Sumant Kulkarni
Convener, SMPARCE-2024
Professor, School of Civil Engineering
REVA University, India

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Program Schedule

Day 1 - 12.07.2024	
09.00 AM to 10.00 AM	Conference Registration Venue: Kalpana Chawla Seminar Hall (C V Raman Block)
10.00 AM to 11.00 AM	Inaugural Function Venue: Kalpana Chawla Seminar Hall (C V Raman Block)
11.00 AM to 11.20 AM	High Tea and Group Photo
11.20 AM to 12.40 PM	Opening Keynote Session by Dr. K. V. Jayakumar Visiting Professor cum Outreach Advisor, Indian Institute of Technology (IIT) Dharwad, Karnataka, India. Venue: C N R Rao Seminar Hall (C V Raman Block)
12.40 PM to 01.30 PM	Lunch
01.30 AM to 2.30 PM	Keynote Session by Dr. Ramesh Nayaka Assistant Professor, Department of Civil and Infrastructure Engineering, IIT Dharwad. Venue: Library Seminar Hall, Central Library
02.30 PM to 02.45 PM	High Tea
02.45 PM to 04.25 PM	Paper Presentations

Day 2 - 13.07.2024	
10.00 AM to 11.30 AM	Keynote Session by Mr. Venkat Lakkavalli, Associate Director, ICRC UK, Highways, UK Venue: Library Seminar Hall, Central Library
11.30 AM to 11.45 AM	High Tea
11.45 AM to 1.00 PM	Paper Presentations
1.00 PM to 2.00 PM	Lunch
2.00 PM to 3.00 PM	Paper Presentations
3.15 PM to 4.15 PM	Valedictory Venue: Kalpana Chawla Seminar Hall (C V Raman Block)
4.10 PM to 4.30 PM	High Tea

Speaker Biodata

Key Note Speaker: Prof. K V Jayakumar

Prof. K.V. Jayakumar, is presently working as Visiting Professor cum Outreach Advisor at the Indian Institute of Technology (IIT) Dharwad. Prior to this, he was Professor (Higher Administrative Grade – HAG) of Civil Engineering at the National Institute of Technology (NIT) Warangal. He has held various academic and administrative responsibilities in the institute including Dean (Planning & Development), Dean (International Relations & Alumni Affairs), Advisor to the Director - Special Programmes, nominated member of the Board of Governors and the Finance Committee of the institute, Coordinator of GIAN (Global Initiative for Academic Network) and SPARC (Scheme for Promotion Academic and Research Collaboration), Head of the Department etc. Between July 2008 and December 2011. He was on deputation as the Executive Director of the Centre for Water Resources Development and Management (CWRDM), Kozhikode, Kerala. During 2010- 2011, he held full additional charge as Director, Centre for Science and Technology Entrepreneurship Development (C-STED) of the Government of Kerala, and Kerala School of Mathematics. He had visiting assignments at the University of Essen Germany, Griffith University Brisbane, Australia, and the University of Peradeniya Sri Lanka. He had research and teaching experience at KREC Surathkal, Centre for Water Resources, Anna University, Chennai and IIT Kanpur. He was honoured by NITK Surathkal with the Distinguished Alumnus Award during the Diamond Jubilee Celebrations of the institute. He was also awarded Prof Rangaraju Award for Excellence in Water Resources Research in April, 2019. He is member of Governing Body of Wetlands International South Asia Returning to Bangalore, Mr. Sundar brought his wealth of experience to BIAL, focusing on the expansion and development of Kempegowda International Airport. His role involves overseeing sustainability initiatives and implementing innovative solutions, ensuring that the airport's growth aligns with global standards of excellence and environmental stewardship.

In 1992, Prof. Jayakumar was awarded the UNESCO fellowship to participate in the IV International Course on Urban Drainage in Developing Countries (UDDC) at the Asian Institute of Technology, Bangkok. In 1996, along with Prof. Wolfgang F. Geiger of the University of Essen, Germany, he coordinated the V International Course on UDDC at Warangal in 1996, first of its kind to be organized in India, and a follow up course for Indian engineers and academicians in 2001. In 2003, he received the International Visiting Fellowship of the Environmental Water Resources Institute (EWRI) of American Society of Civil Engineers (ASCE), to visit the Universities of Pennsylvania in Philadelphia and Colorado at Boulder. He had the honour of launching the South India Chapter of EWRI during the EWRI conference held at IIT Chennai in January, 2010. During May 2011, he organised the Third International Geography Congress at CWRDM, Kozhikode that attracted the best of geographers, and experts in GIS and water resources across the world. Prof. Jayakumar has been a part of the 8-member Working Group on Urban Water Management constituted by UNESCO.

Prof. Jayakumar has over 120 publications in national and international journals/conference proceedings and has delivered keynote addresses at many renowned conferences at national and international levels. He is a member/fellow of many national and international professional bodies. He is proficient in English, Malayalam, Tamil, Telugu, Kannada, Hindi, and has elementary working knowledge in German, French and Russian.

Key Note Speaker: Dr. Ramesh Nayaka

Dr. Ramesh Nayaka is presently working as Assistant Professor in the Department of Civil and Infrastructure Engineering at IIT Dharwad. He obtained his Ph.D. in Structural Engineering and Materials from University of Malaya (UM) in Malaysia (2016-2019) and He was also given a thesis excellence award in 2019. Dr. Nayaka attended IIT Madras and earned an M.Tech. in Building Technology and Construction Management (2011-2013). He obtained B.Eng. in Civil Engineering (2007–2011) from VTU Karnataka (BEC Bagalkot).

Dr. Nayaka worked as an assistant professor in the Department of Civil Engineering at NIT Warangal (2019-2023), MAHE, Manipal, Karnataka, and NIT Calicut before joining the IIT Dharwad. His career covers more than 10 years, including pre- and post-Ph.D. experiences in both teaching and research. He has guided more than 24 PG dissertations and 6 UG final year projects and currently supervising 7 Ph.D. thesis.

Dr. Nayaka has research articles published in esteemed journals and research initiatives supported by SERB. Dr. Nayaka is a Chartered Engineer (C.Eng.) (IEI, India), a journal reviewer, and a member of ASCE, Project Management Institute (PMI), RILEM, the Indian Institute of Engineers (IEI), the Institute of Structural Engineers, and the Association of Civil Engineers (UK).

Dr Ramesh Nayaka possesses expertise in the structural engineering, materials and construction technology and management. Further research interests include value -addition analysis innovation in terms composite materials and structures, innovative design of materials and structures, as well as the development of new approaches in fabricating free-form structural elements. His extensive expertise and experience are crucial for the proposed project, which focuses on the performance of AAC blocks, self- healing concrete, and 3D concrete printing technology. Dr. Nayaka has research articles published in esteemed journals and research initiatives supported by SERB. He contributed to several projects, including environmentally friendly building materials consisting of local waste materials for affordable housing, green hollow blocks, Low Carbon Footprint Precast Concrete Products for An Energy Efficient Built Environment (lowcoprecon), BIM Approach in Life Cycle Cost and Environment Assessment of FRC Slabs and Innovative Development of Sustainable Wall Cladding Systems to Curtail the Heat Ingress.

Key Note Speaker: Mr. Venkat Lakkavalli

Mr. Venkat Lakkavalli is presently working as Head of Highways, WSP, India. He has completed Master of Science (M.Sc.), Civil Engineering from University of Calgary, Canada, in the year 2008 & Bachelor of Engineering, Transportation Engineering from VTU, India, in the year 2004. He has also worked as Associate Director, Asset Management, Apleona Inc., Toronto, Canada from Jun 2018 to Oct 2020. He also worked for various roles such as leader in Pavement Engineering (Jun 2016 to Jun 2018), Business Strategist/ Senior Planning & Infrastructure Engineer (Jun 2015 to Jun 2016), Senior Pavement Engineer (Aug 2013 to Jun 2015) at the City of Calgary, Canada, Resident Engineer Highways(Dec 2011 to Aug 2013), Travel Demand Forecasting Engineer (Dec 2010 to Dec 2011), Consultant Compliance Engineer (Jul 2010 to Dec 2010), Pavement Engineer (May 2008 to Jul 2010) at Ministry of Transportation, Government of Alberta, Canada, Pavement Research Associate, University of Calgary, Civil Engineering, Canada (Jan 2006 to May 2008) & also as Pavement Engineer, Keshav & Associates, Bangalore, India (Jun 2004 to Nov 2005).

He is a civil engineer with diversified experience in infrastructure planning, design, construction, operations and maintenance and asset management. Result-oriented, consensus builder and strong decision-making abilities through collaboration with various stakeholders. He has demonstrated strong organizational, operational, and leadership and management skills by managing multi-billion-dollar infrastructure projects, building and leading technical teams of diverse composition. He is specialized in pavement engineering and management, bid advisory, infrastructure monitoring, maintenance, and rehab programs, achieving KPIs, managing non-conformances, business process improvements, finding operational efficiency by applying Lean principles, project/construction management, QA/QC, innovation to provide state-of-the-art, cost-effective & sustainable solutions – global answers to local challenges. Adept with audits, compliance, business continuity and to ensure maximum utilization of in-house resources.

Mr. Venkat Lakkavalli has various professional associations such as Professional Engineer (P.Eng.) The Association of Professional Engineers & Geoscientists of Alberta, Canada, Chartered Engineer (CEng. MIEI) Engineers Ireland, Ireland, Member of World Road Association (PIARC) Pavement Technical Committee (2016-19 & 2020 -23) & Member of Transport Association of Canada (TAC) Technical Committees (a) Pavements.

Presently, he is the country head of Highways Discipline in India, managing the UK business. He is responsible for all aspects including team growth, business expansion, project/technical innovation and excellence, operational excellence and revenues. In 18 months, he has organically almost tripled the team size from 60 to 165 employees. He has improved utilization from 64% to 92%, enhanced multipliers by 5% to 2.52 and the revenues proportionally & improved retention by deploying employee friendly measures to meet their career aspirations – skill diversification, greater exposure to UK clients, and opportunities to lead complex projects from India. He has also improved inclusion and diversity by enhancing women representation from 16% to 34%.

List of Articles

S. No.	Article ID	Article Title
1.	CIVIL002	Runoff Simulation of Wardha River Catchment using HEC-HMS
2.	CIVIL003	Performance of GFRP Bars in Flexural Members: A Comparative Study with Metal Bars Using FEA and Experimental Study
3.	CIVIL004	Use of Waste Tyres as Fractional Replacement of Bitumen
4.	CIVIL005	Predicting Axial Load-Carrying Capacity of Prefabricated Sandwich Wall Panels: A Finite Element Analysis Study
5.	CIVIL006	Mechanical Properties and Micro Structural Analysis of Light Weight Aggregate Concrete
6.	CIVIL007	Removal of Heavy Metals by Adsorbent Method using Eucalyptus And Jack Fruit Peel
7.	CIVIL008	A Comprehensive Study on Elemental Analysis and Sustainable Integration of Common Effluent Treatment Plant (CETP) Sludge as a Fine Aggregate Replacement in Concrete
8.	CIVIL009	Condition Assessment & Structural Audit of Fire Damage Structure
9.	CIVIL010	Analysis of Railway Bridge of various Spans of Composite Standard RDSO Girder for Rail Structure Interaction
10.	CIVIL011	Waste PET Plastic Bottles filled with C&D Waste Mortar as Bricks: A Sustainable Construction Approach
11.	CIVIL012	Effect of Alccofine on Geotechnical Properties of Landslide Prone soil of Monnageri
12.	STR001	Enhancing Concrete Strength Properties with Use of Glass Powder and Fly Ash as Partial replacement of cement
13.	STR002	Feasible study on utilization of granite powder and fly ash as partial replacement of cement in concrete mixes to determine the strength characteristics
14.	STR003	Analytical Investigation of Castellated Beams with Tapered Web under Lateral Torsional Buckling
15.	STR004	Mechanical properties of the concrete by partial replacement of cement with granite powder and eggshell powder
16.	STR005	Finite Element Analysis of Steel Beams under Flexural and Torsional Effects
17.	STR006	A Comprehensive Analysis comparison between Evaluation of the Capillary rise in traditional walls and Geomembrane blend Walls
18.	STR007	Experiment on Using Industrial & Agro Waste in Cement Bricks
19.	STR008	Performance Evaluation of Geopolymer Bricks Incorporating GGBS and Fly Ash
20.	STR009	Finite Element Analysis of Doubly Reinforced Concrete Beams Under Flexure
21.	STR010	Non-linear Analysis of Reinforced Concrete Skew Slabs using Finite Element Method
22.	STR011	Strengthening RCC Structures: Maximizing Earthquake Resistance by including Bracing and Shear Wall
23.	STR012	Fortifying RCC Frameworks: Incorporating friction dampers and bracing to optimize seismic resistance
24.	STR013	Comparative Analysis of High-Rise RCC Building subjected to Blast Load
25.	STR014	Comparative Analysis on Structural Form for Seismic Zone using Bracings & Shear Wall
26.	STR015	Effect of perlite powder on performance of bacterial Concrete
27.	STR016	Evaluation of Strength Properties of Bacterial Concrete using Perlite Powder as Partial Cement Replacement

S. No.	Article ID	Article Title
28.	STR017	Analysis Of Outrigger Structural System with Belt Truss Subjected To Lateral Force
29.	STR018	Performance Based Seismic Design Of RC Framed Building Using Time History Method
30.	STR019	Analysis Of Reinforcement Cement Concrete Elevated Water Tank in SAP2000 Software
31.	STR020	Experimental Investigation On Effect Of Carbon Fiber On The Flexural Performance Of Concrete Made With Optimum Sugar Cane Bagasse Ash
32.	STR021	Confinement Effect On Modulus Of Elasticity Of RCC Beam
33.	CTM001	Analysis of Delays in Commercial Construction Project
34.	CTM002	Performance studies on Recycled Aggregate based Self Compacting Concrete (SCC)
35.	CTM003	Transparent Concrete: An Experimental Study using Rice Husk Ash and Gass Optical Fiber
36.	CTM004	Experimental Study on Load Deflection Behaviour of Concrete Beams using Light Weight Aggregate
37.	CTM005	Managing schedule progress using Primavera P6 and GIS
38.	CTM006	Analysis of Cost Overrun in Construction Project in Nepal
39.	CTM007	Reducing The Cost Overrun of Construction Project
40.	CTM008	Analysing Risks involved in a Home Decor Project using Primavera Software
41.	CTM009	Analysing Delays in Construction Project on Residential Building
42.	CTM010	Duration Reduction of Construction Project
43.	CTM011	Key Performance Indicators (KPI) as Success Factors for Affordable Housing Projects
44.	CTM012	Impact of Mental Health and Wellness on Construction Worker's Productivity and Safety
45.	CTM013	Performance Studies on Recycled Concrete Aggregate Based Self-Curing Concrete
46.	CTM014	Effect of Mechanical Properties on Self-healing Concrete (Mixture of Recycled aggregate, Fly ash and Polypropylene fibre)
47.	CTM015	Experimental Investigation of High Strength Fibre Reinforced Concrete
48.	CTM016	Performance Study of Durability Characteristics of Light Weight Concrete
49.	CTM017	Study on Mechanical Properties of Coarse Plastic Aggregate incorporated in Concrete
50.	CTM018	Development of Eco-Friendly Bricks using GGBA and Zeolite
51.	CTM019	Critical Project Management Factors in Delivering Green Building Project
52.	CTM020	Performance study on Light-Weight Aggregate Concrete using Pumice Stone by Microstructural Tests
53.	CTM021	Reducing Cost and Time using Value Engineering
54.	CTM022	Investigation on strength and durability characteristics of coconut fiber reinforced concrete
55.	TEM001	Modelling Of Metro Performance: A Case Study In Bangalore City Metro
56.	TEM002	Evaluating Safe and Sustainable Bicycle Sharing Systems in Urban India: A Case Study of Bengaluru
57.	TEM003	Laboratory Investigation of Alkali Activated Slag Concrete using Reclaimed
58.	TEM004	Performance Assessment of Robo Sand in Enhancing the Behavior of Expansive Subgrade
59.	TEM005	Geotechnical Behaviour of Xanthan Gum Treated Micecous Soil
60.	TEM006	Geotechnical Behaviour of Lime Treated Micecous Soil

Research Article Abstracts

SMPARCE2024_CIVIL_002

Runoff Simulation of Wardha River Catchment using HEC-HMS

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Abstract. Computer-based hydraulic simulations have advanced significantly, aiding in understanding human impacts on river flows and sustainable water management. The widely used HEC-HMS model, developed by the US Army Corps of Engineers, lacks specific calibration for Indian watersheds. This study aimed to assess HEC-HMS 4.10's suitability for the study area, using three calibration methods: deficit and constant loss, Soil Conservation Service Curve Number, and Green and Ampt. The primary goal was to find the best simulation approach for the study catchment's characteristics. A comprehensive study within the Wardha River catchment area utilized an 18-year dataset, which included daily rainfall and temperature data from the Indian Meteorological Department (IMD) recorded at a fine spatial resolution of 0.25° × 0.25°. Daily potential evaporation calculated using the Hargreaves Equation was also incorporated. Daily flow data from the India Water Resources Information System, specifically from the Sirpur gauge discharge station outlet (spanning 2001 to 2018), completed the dataset for in-depth hydrological analysis. Geographic Information System (GIS) layers were integrated into the calibration process using HEC-HMS 4.10 software, enhancing the study's hydrological modelling and analysis capabilities. Following calibration (2001-2010), the model's performance was rigorously evaluated with a new dataset (2011-2018), using metrics like RMSE, Nash-Sutcliffe Efficiency, and R^2. The findings revealed that the most dependable flow simulations were achieved by combining the Soil Conservation Service Curve Number loss method with the SCS unit hydrograph approach, surpassing the performance of the Clark unit hydrograph and Snyder unit hydrograph methods. However, it's important to note that when the Soil Conservation Service Curve Number method was employed as the loss method, the Snyder Unit Hydrograph method did not yield satisfactory results. On the contrary, the other two loss methods, specifically the Deficit and Constant Loss method and the Green and Ampt loss method, produced nearly indistinguishable values in terms of Nash Sutcliffe efficiency and other statistical parameters when paired with all three unit hydrograph methods. This underscores their consistency and reliability in generating hydrological simulations within the study's context.

Keywords: HEC-HMS, Rainfall runoff Modelling, Clark unit Hydrograph, Snyder unit Hydrograph, SCS-CN Unit Hydrograph

SMPARCE2024_CIVIL_003

Performance of GFRP Bars in Flexural Members: A Comparative Study with Metal Bars Using FEA and Experimental Study

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Abstract. In the recent years, GFRP bars are introduced as the replacement of metal bars as reinforcement in the flexural members. This study evaluates the use of GFRP bars as main reinforcement in flexural members such as beams through computer simulations and experimental work. Beams reinforced with 6 mm and 20 mm

GFRP bars were tested, and finite element models were developed using ANSYS. Additional models were analyzed by replacing GFRP bars with its equivalent metal bars for comparison purpose. Simulation results showed that models with metal bars exhibited slightly lower deformation, resulting in higher stresses in the concrete and metal bars compared to those with GFRP bars. The experimental results demonstrated that larger GFRP bars provide greater strength. The findings suggest that GFRP bars are a viable alternative to metal bars for reinforcing beams, particularly for applications requiring high strength and reduced stress.
Keywords: GFRP rebar, finite element analysis, flexural strength.

SMPARCE2024_CIVIL_004

Use of Waste Tyres as Fractional Replacement of Bitumen

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Abstract. Waste tyres have lately proved to be an ecological and fiscal burden in numerous regions of the world. Moment utmost of the tyres, especially those fitted to motor vehicles, are manufactured from synthetic rubber. And as we all know that, India is the alternate fast growing machine assiduity in the world. As the number of vehicles is also adding so are the stacks of the discarded rubber tyres. Waste tyres and their accumulation is a global environmental concern as they aren't biodegradable, and encyclopedically an estimated 1.5 billion are generated annually. Waste tyres in tip and stashes are famed for filtering poisonous chemicals into the girding terrain, acting as breeding grounds for mosquitoes and fueling inextinguishable fires. One of the main issues associated with the operation of scrap tyres has been their proper disposal. In this design work, a trouble has been made to make use of these waste tyres in subgrade and subbase layers of the flexible pavement. Waste tyres are crushed and colorful accoutrements from it like sword line, gas, oil painting and carbon dark are separated to produce scruple rubber (fine patches). Also the admixture of scruple rubber and asphalt is applied on road face. The modified bitumen and granulated or Crumb rubber can be used as a portion of the fine gravestone total. Using of Crumb rubber when in the underpinning of asphalt is considered as a smart result for sustainable development by reusing waste accoutrements , and crumb rubber modifier(CRM) could be an indispensable material for perfecting hot blend asphalt performance parcels. The waste tyre rubber appears to retain the eventuality to be incompletely added in bitumen, furnishing a recycling opportunity. However, and disposing off the tyres, therefore the environmental earnings can be achieved if waste or used tyre rubber can be added in bitumen for perfecting the parcels.
Keywords: Tyres, crumb rubber modifier, pavement, asphalt, polymer materials, scruple rubber.

SMPARCE2024_CIVIL_005

Predicting Axial Load-Carrying Capacity of Prefabricated Sandwich Wall Panels: A Finite Element Analysis Study

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Abstract. The Light House Project (LHP) is an initiative by the Ministry of Housing and Urban Affairs, India, which utilizes the Prefabricated Sandwich Panel System as a replacement for traditional brick walls, aiming to achieve lower costs and provide affordable housing. These panels are prepared by sandwiching foamed concrete between two calcium silicate boards. Currently, these panels are used solely as wall panels and are

not subjected to any axial loads. The main objective of this research is to predict the axial load-carrying capacity of these wall panels with different thicknesses. Finite element analysis is employed to analyze these panels under static loads and buckling loads. The results show uniform stress distribution across the foam concrete and calcium silicate board. The study also concludes that the load-carrying capacity of the panel increases (following a second-degree polynomial trend) with the thickness of the panel.

Keywords: Light House Project, Prefabricated Sandwich Panel, Finite Element Analysis, Load Multiplier, Buckling Load.

SMPARCE2024_CIVIL_006

Mechanical Properties and Micro Structural Analysis of Light Weight Aggregate Concrete

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Abstract. The construction industry is constantly seeking innovative materials and techniques to address the growing need for sustainable and energy-efficient building solutions. Light weight aggregates (LWAs) have emerged as a promising alternative to traditional heavy aggregates due to their reduced weight and improved insulation properties. This abstract provides an overview of the key characteristics, production methods, and applications of light weight aggregates, highlighting their significant contributions to sustainable construction practices. Light weight aggregates are manufactured using various materials, including expanded clay, shale, slate, and fly ash, through processes such as sintering, palletization, and foaming. These aggregates possess a cellular structure that results in reduced density and enhanced thermal insulation properties. Moreover, they exhibit excellent fire resistance, sound absorption, and durability, making them highly suitable for diverse construction applications. The lightweight nature of these aggregates offers several advantages. First, they significantly reduce the structural load, leading to more efficient designs, lower transportation costs, and simplified installation procedures. Second, the improved thermal insulation properties contribute to energy conservation by minimizing heat transfer through the building envelope. This leads to reduced reliance on mechanical heating and cooling systems, resulting in lower energy consumption and associated greenhouse gas emissions.

Keywords: Light weight aggregate, Mechanical properties, Microstructural analysis.

SMPARCE2024_CIVIL_007

Removal of Heavy Metals by Adsorbent Method using Eucalyptus And Jack Fruit Peel

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Abstract. In the present study, Eucalyptus carbon powder was used as an adsorbent for the removal of Heavy metals such as Iron, Cobalt, Nickel. Highest adsorption capacity of Iron was found with an initial concentration of 100 ppm solution. Hence the present study reveals that the low cost adsorbent of Eucalyptus carbon may be used for removing the above said heavy metals present in Ground Water.

Keywords: Heavy metals, Eucalyptus carbon, Adsorption.

SMPARCE2024_CIVIL_008

A Comprehensive Study on Elemental Analysis and Sustainable Integration of Common Effluent Treatment Plant (CETP) Sludge as a Fine Aggregate Replacement in Concrete

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Abstract. This study examines the viability of employing CETP (Common Effluent Treatment Plant) sludge as a partial substitute for fine aggregate in M20 grade concrete. The research aims to address disposal issues associated with CETP sludge while enhancing natural resource sustainability. Mechanical and microstructural properties of concrete with varying percentages of CETP sludge replacement (0%, 10%, 20%, 30%, 40%, and 50%) were evaluated. The study included compressive, flexural, and split tensile strength tests, as well as durability tests such as dry and wet durability, sulphate resistance, and chloride penetration. Energy Dispersive X-ray Analysis (EDAX) was used to identify significant elements in CETP sludge, including chromium, zinc, nickel, copper, iron, sodium, lead, cadmium, and potassium, which showed impacts ranging from enhanced corrosion resistance to potential structural reinforcement. The results indicated that a 10% replacement of fine aggregate with CETP sludge optimized compressive strength, achieving an average of 21.01 N/mm² after 28 days of curing, compared to 26.58 N/mm² for conventional concrete. Tensile strength at 10% replacement was 2.40 N/mm², slightly lower than the control's 2.90 N/mm², and flexural strength for the 10% replacement mix was 1.61 N/mm² after 28 days, compared to 2.11 N/mm² for the control. The slump test results showed good workability, with a slump value of 100 mm for the 10% CETP sludge replacement mix. The study confirms the technical feasibility and economic viability of incorporating CETP sludge into concrete, potentially reducing fine aggregate costs by 10%. This research supports the development of eco-friendly building materials, highlighting the environmental benefits of waste reduction and resource conservation. It aligns with sustainable development goals by providing a viable solution for waste management and promoting sustainable construction practices.

Keywords: CETP sludge, fine aggregate replacement, mechanical properties, EDAX analysis, Sustainable construction.

SMPARCE2024_CIVIL_009

Condition Assessment & Structural Audit of Fire Damage Structure

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Abstract. Fire in structures can cause higher temperatures at the concrete surface, reducing its compressive strength and modulus of elasticity. The architectural and structural design significantly impacts its fire safety standards. Building fires can cause high fatalities due to greater occupant numbers and complex egress paths. The objective is to prevent fire spread and ensure structures do not collapse before evacuation. This study examines the effects of fire on concrete structures and technical requirements for investigating, assessing, and repairing fire-damaged reinforced concrete structures. Concrete structures are typically not destroyed in fires or thermal exposures, making them easy to fix and reuse post-fire. However, after a fire, it is crucial to determine if the residual safety level is still sufficient despite mechanical decay. Non-destructive evaluations of concrete, such as rebound hammer test have been performed to assess the condition of existing buildings. This case study examines a commercial and residential building in Chaoni Chowk near Metro Hospital Nagpur, which was severely damaged by a fire. The building, which has 964.096 sq. ft of built-up area on each floor, was destroyed due to a short circuit. The structure is found to be in dilapidated condition, with the exterior portion severely damaged and the reinforcement of columns melting due to the fire. The building also

suffers from spalling of concrete, highly damaged columns, beams, slabs, wall cracks, deflected slabs and beams, and damaged exterior walls, particularly the exterior walls.

Keywords: Structures, Compressive Strength, Modulus of Elasticity, Fire Safety, Building Fires, Evacuation, Reinforced Concrete, Load-carrying Capacities, Strengthening, Safety Standards.

SMPARCE2024_CIVIL_010

Analysis of Railway Bridge of various Spans of Composite Standard RDSO Girder for Rail Structure Interaction

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Abstract. Long welded rails (LWR) have been used in metro rail systems to provide smoother, safer and less maintenance-requiring operations at high speeds. Due to the configuration of the interconnection of rail and deck systems, there is interaction in power transfer. Rail-structure interaction (RSI) analysis is a technique used to examine this effect in structures. The performance of the composite structure, rail stress and relative deformations were analyzed. Limits of overhead and the impact of RSI analysis are mentioned, according to the guidance of RDSO and UIC standards. The first floor of the viaduct construction, which is planned to be built on two floors, will carry the road load, and the second floor of the railway will carry the traffic. It is recommended to use four continuous decks on highway bridge decks to protect passengers from discomfort caused by continuous joints and to ensure a comfortable journey. This paper considers the above two-storey superstructure complex with different types of superstructure at the metro level due to the need for monitoring such as U-beam slab, I-beam slab for each road, and examines the impact of RSI on the road. The highway Level has a continuous slab and I used the beam slab as a slab for the two lanes of the transition/pocket. To examine the interaction between bilayer bridge structures, endpoint analysis was performed using the MIDAS CIVIL software analysis tool. The ballastless runway and bridge deck in this study were attached using multilinear elastic springs approved by UIC 774-3R, with additional limits per IRS and IRC regulations. This study examines the behavior of infrastructure as a result of temperature and live pressure and force loads at the metro system and highway level.

Keywords: Rail structure interaction; Continuous welded rail; Metro bridge; UIC 774-3R.

SMPARCE2024_CIVIL_011

Waste PET Plastic Bottles filled with C&D Waste Mortar as Bricks: A Sustainable Construction Approach

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Abstract. With the advancement of technology in the world, the production and commercialization of plastic drastically increased to an extent where it has turned into a concern for its negative impact on the environment. The Polyethylene Terephthalate bottles used for storage of drinking water and soft drinks find its way to the soil or water bodies due to improper disposal and mismanagement of plastic waste. This creates an opportunity to utilize them in the Construction Industry as an alternate building material. This research is an experimental attempt to use the waste PET bottles filled with Construction and Demotion waste, another major pollutant in urban regions, utilizing them as building materials. The experimental samples of bricks and brick masonry prism are tested for its mechanical property namely compressive strength to gauge its compliance with the IS standards. In order to make the research more sustainable, samples were also tested with the Demolition waste mortar in place of cement mortar and it can be inferred to have provided feasible results where the waste PET

plastic bottles filled with C&D waste mortar can be suggested as a building material for non-load bearing structures. The research aims at plastic waste utilization for low cost sustainable construction.

Keywords: Polyethylene Terephthalate (PET), Waste plastic bottles, eco-friendly construction, sustainable construction practices, alternate building material, construction demolition waste, plastic waste.

SMPARCE2024_CIVIL_012

Effect of Alccofine on Geotechnical Properties of Landslide Prone soil of Monnageri

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Landslides triggered by heavy rainfall pose significant hazards in steep, loose-soiled regions, leading to infrastructure damage and loss of life. Addressing these challenges requires effective mitigation strategies. This study investigates the effectiveness of Alccofine 1203 a slag-based ultra-fine supplementary cementitious material, in improving the engineering properties of landslide-prone soil in Monnageri village, Kodagu, Karnataka. Soil samples treated with varying concentrations of Alccofine were tested for liquid limit, plastic limit, plasticity index, compaction characteristics, and unconfined compression strength. The results showed significant improvements in soil stability and strength parameters with increasing Alccofine dosage. Specifically, the plasticity index decreased as Alccofine concentration increased, indicating reduced soil susceptibility to volume changes. Compaction tests demonstrated an increase in soil density up to 6% Alccofine addition, beyond which density declined, accompanied by an increase in optimum moisture content. Unconfined compression tests revealed higher strength values with longer curing periods and higher Alccofine concentrations, attributed to the formation of secondary cementitious products over time. These findings highlight Alccofine's potential as an effective stabilizing agent for landslide-prone soils, offering sustainable improvement in soil properties while utilizing industrial by-products. This research supports the use of Alccofine in engineering practices aimed at mitigating landslide risks and enhancing environmental sustainability.

SMPARCE2024_STR_001

Enhancing Concrete Strength Properties with Use of Glass Powder and Fly Ash as Partial replacement of cement

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Abstract. The present need for sustainable materials and their enhancement is an outcome of the ongoing accumulation of various local wastes that constitute hazards to the environment. Cement contributes to around 7% of greenhouse gas emissions into the environment from the construction industry. From this angle, the mechanical characteristics of concrete could be improved by partially substituting cement with a substance that has pozzolanic capabilities. Fly ash has previously shown its worth as an additional cementitious ingredient, and adding a certain amount of fly ash to cement reduces the amount of waste that large thermal power plant fly ash generates. Conversely, glass finds several applications in our daily lives. It has a finite lifespan. There is a great need to use waste glass since the safe storage or disposal of glass trash poses an environmental concern. This investigation will be conducted with the aim of determining whether it is feasible to use fly ash and leftover glass powder in place of some cement in concrete. Fly ash replaces cement to a percentage of 10% to 30% with an interval of 10%, whereas glass powder replaces cement to a range of 15%

to 25% with an interval of 5%. Executed tests at 7, 14, and 28 days to examine for slump, strengthened features, split tensile strength, and compressive strength. The maximum compressive and tensile strengths are found with a 20% substitution of glass powder as well as fly ash. However, it has been determined that concrete with a 20% replacement rate for each of the two constituents has been shown to be sustainable.

Keywords: Glass powder, fly ash, compressive strength, split tensile strength.

SMPARCE2024_STR_002

Feasible study on utilization of granite powder and fly ash as partial replacement of cement in concrete mixes to determine the strength characteristics

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Abstract. Currently, concrete generated with cement is probably the most frequently utilized artificial substance on the planet. Still, concrete production is one of the world's most significant environmental issues, with the largest consequence being global warming owing to the release of carbon dioxide during the construction procedure. Waste from industries can be used to control CO2 emissions and as a substitute for cement. As a consequence, a proposal is made to substitute the cement with granite powder along with fly ash in concrete construction. The evaluation will be carried out on the grade M40 concrete. The main idea of this experiment is to figure out if both of the substances mentioned above can be used as a substitute for cement in a specific proportion. The present study examined the tensile strength and compressive strength of conventional concrete, granite powder concrete, fly ash concrete, and the combination of the two components. The compressive, split tensile, and flexural properties were determined after 7 days, 14 days, and 28 days of standard curing. In the present investigation, granite powder has been used as a partial replacement for cement in percentages that varied from 5% to 15% with an interval of 5% by weight, as well as fly ash in percentages varying from 10% to 30% with an interval of 10% by weight. In accordance with the experiment's outcomes, 10% cement substitution with granite powder and 20% cement substitution with fly ash were preferable.

Keywords: Granite powder; fly ash; compressive strength; tensile strength.

SMPARCE2024_STR_003

Analytical Investigation of Castellated Beams with Tapered Web under Lateral Torsional Buckling

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Abstract. An I-beam that has been longitudinally chopped following a predetermined pattern along the web is called a Castellated beam. Deeper webs will be created by splitting and recombining the beam using the cutting pattern. One criterion of failure for beams in flexure is Lateral Torsional Buckling (LTB). This work aims to examine the behaviour of lateral torsional buckling in castellated beams using ANSYS software and to examine the impact of torsion on castellated beams by supplying beams at different depths. By keeping the opening ratio of the castellated beam constant throughout its span, the opening area is maximized. All castellated steel beams with tapered sections at the ends that are decreased by 25%, 50%, and 75% of their height have had their lateral torsion analyses completed. By taking into account the buckling load and the support condition with simply supported, the elastic lateral torsional buckling moment for various beam sections is calculated.

Keywords: Castellated steel beam, Lateral torsional buckling, Tapered Section.

SMPARCE2024_STR_004

Mechanical properties of the concrete by partial replacement of cement with granite powder and eggshell powder

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Abstract. A large amount of granite waste and eggshell waste is produced annually worldwide. Proper disposal of waste granite powder and eggshell powder is crucial for reducing environmental pollution and achieving sustainable development. In this study, on M40 grade concrete granite powder and eggshell powder were partially added to the concrete. Therefore, reuse granite powder and eggshell powder as an additive in concrete is a better solution to reduce the environmental problem. The role of admixtures effect on concrete mechanical properties and to achieve the optimum percentage of eggshell powder and granite powder utilization for higher strength in the concrete, which gives the maximum strength when compared to regular conventional concrete. The investigation is carried out into various percentages which are 0%, 5%, 10%, and 15%. After curing period of 7, 14 and 28 days, various tests will be conducted for concrete to know the strength by varying proportions of granite powder and eggshell powder with cement, tests are compressive strength, split tensile strength and flexural strength tests were conducted. The obtained results will be analyzed and compared with the regular convention concrete, there by knowing the changes in the mechanical properties of the concrete containing granite powder and eggshell powder as a partial replacement of cement and the results were analyzed.
Keywords: M40 grade concrete, Granite Powder, Eggshell Powder, Ordinary Portland Cement.

SMPARCE2024_STR_005

Finite Element Analysis of Steel Beams under Flexural and Torsional Effects

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Abstract. There are situations in which a Steel beam is subjected to Torsion and Flexural, such as members that are buckled linear beams in buildings. A three dimensional (3D) finite element model is introduced in this paper to simulate Steel beams subjected to combined flexure and torsion using a commercial software ABAQUS. In this paper, we examined how various section beams behave when subjected to coupled bending and torsion under various loading scenarios and support conditions. The various geometrical sections involve solid and hallow rectangular, solid hollow Circular, Symmetric-I and Unsymmetric-I section, T- section and C- section subjected to transverse point load and torsional moment and with simply supported, cantilever, Fixed end condition by using the software. The length of beam for different sections of beams is kept as 1, 3, 5, 7 meters. The effect of varying length for different loading conditions are studied. The effect of bending and torsion were examined along with the transverse, axial deformation and stresses. It was noted that the transverse and axial deflection were visible where the concentric force was applied. The effects of bending and torsion were investigated in addition to the shear and axial stresses. Maximum stress generation is caused by the torsional moment that causes deformation in the form of cross section twisting. The obtained results were validated by comparing results from analytical method and the open sources application of SKYCIV.
Keywords: Shear stress, Deflection, Bending stress, Flexural, Torsion, Torque

SMPARCE2024_STR_006

A Comprehensive Analysis comparison between Evaluation of the Capillary rise in traditional walls and Geomembrane blend Walls

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Abstract. Mold growth on coastal walls is a big concern due to the high humidity and moisture levels that exist in these areas. Here, the uses High-Density Polyethylene (HDPE) geomembranes to successfully reduce Mold growth on coastal walls. The effectiveness of HDPE geomembranes in forming a barrier against moisture infiltration, hence preventing conditions suitable to Mold growth. Investigating the features of HDPE geomembranes that make them appropriate for this application, such as water impermeability and resistance to environmental degradation. Furthermore, it explores analytical ways for incorporating HDPE geomembranes into coastal wall construction and maintenance operations. Through a combination of theoretical research and analytical experimentation, illustrating the usefulness of this new method to safeguarding. The current study looks into elements such as material composition, wall thickness, application processes, and drainage systems to improve the performance of coastal walls in reducing capillary rise damming. Furthermore, a comparison of the environmental and economic benefits of geomembranes wrapped walls in coastal settings is shown, along with a pressure analysis of standard and geomembranes wrapped walls. The findings show considerable reductions in capillary rise-induced damage, demonstrating the promise of this novel method for coastal preservation and sustainable development. Geo-membrane mix walls can be an efficient solution for controlling capillary rise damage in coastal structures while also providing a long-lasting, cost-effective, and environmentally friendly alternative to standard wall systems. More research and implementation efforts are required to fully actualize. Mold development caused by capillary rise is a common problem in buildings, particularly in coastal areas with inadequate moisture management. Capillary rise refers to the movement of water through porous materials (such as soil or building materials) produced by capillary action, which occurs when the adhesion forces between the water and the medium surpass the cohesion forces inside the water molecules. This analysis-based research seeks to contribute to the development of sustainable and resilient coastal infrastructure solutions by investigating the potential of HDPE geomembranes to protect coastal walls from Mold growth.
Keywords: HDPE geomembrane, capillary rise, Mold growth.

SMPARCE2024_STR_007

Experiment on Using Industrial & Agro Waste in Cement Bricks

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Abstract. This project explores using industrial waste (fly ash, marble dust) and agricultural waste (sugarcane bagasse ash, wood ash) as partial replacements for cement in bricks. We made four types of bricks: one with fly ash and sugarcane bagasse ash, another with fly ash and marble dust, a third with fly ash and wood ash, and a final one combining all three waste materials with fly ash. We're testing these bricks to see how strong they are compared to regular cement bricks. This research aims to develop sustainable bricks by reducing reliance on new cement and utilizing waste products, potentially benefiting both the environment and construction costs. Bricks are one of the widely used construction materials in the industry. The main objective

of experimental work is to study the enhancement of compressive strength of brick when cement is replaced with wood ash, sugarcane bagasse ash, Marble dust,For the experimental work, the size of the mold was used 190*90*90mm.The parameters considered for the study are compressive strength, water absorption capacity which determines its capacity to use as building material. We can observe that as the percentage of increase/decrease has brought change in the compressive strength and the water Absorption.

Keywords: Sustainable bricks, Industrial waste, Agricultural waste, Compressive strength, Cement replacement.

SMPARCE2024_STR_008

Performance Evaluation of Geopolymer Bricks Incorporating GGBS and Fly Ash

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Abstract. The Present Research Study focuses on development of geopolymer bricks as a sustainable substitute for conventional building materials and production of bricks using fly ash and ground granulated blast furnace slag (GGBS) combined with manufactured sand (M-sand) in place of natural sand is the focus of the current study. In Present Research Study bricks are made by an inorganic polycondensation reaction between a highly concentrated alkali hydroxide or silicate solution and solid alumina silicate. The study emphasizes the substantial environmental advantages of geopolymer bricks, especially considering that the cement sector accounts for 5% to 8% of the world's CO2 emissions. Because they are made from industrial waste, geopolymer bricks have a significantly smaller environmental effect, making them an environmentally friendly building material. Comparing geopolymer bricks to ordinary bricks, the current study shows that the geopolymer bricks showed superior compressive strength, minimal water absorption, and good acid resistance. 75% GGBS and 25% fly ash make up the ideal mixture, which produces better mechanical qualities. The study highlights the need for environmentally friendly and sustainable building materials and offers geopolymer bricks as a workable way to cut down on greenhouse gas emissions and the damage that comes from taking natural resources like river sand. The results encourage the application of alkali-activated binders as a workable substitute for Portland cement, promoting environmentally friendly growth within the building sector.

Keywords: Geopolymer Bricks, GGBS, Fly ash, M-sand, Alkali-activated binder Solution.

SMPARCE2024_STR_009

Finite Element Analysis of Doubly Reinforced Concrete Beams Under Flexure

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Abstract. The understanding of moment of inertia, cross-sectional area, and modulus of elasticity plays a pivotal role in structural analysis, particularly in assessing indeterminate structures. In such analyses, it's crucial to consider both the geometric properties and material characteristics of the structural members. In accordance with Indian standards, the modulus of elasticity for concrete is typically defined in terms of its characteristic strength. Reinforced concrete, being a composite material, is extensively utilized in practical construction projects. A current study focuses on evaluating the modulus of elasticity for a beam's cross-section concerning the proportion of compression and tension reinforcement. The beam has dimensions of 250 x 350 x 2300 mm, and it incorporates tension and compression bars of varying diameters. The study

ensures that the doubly reinforced cross-sections being examined are under reinforced, following the guidelines related to limiting moment of resistance and limiting depth of neutral axis as per the codal provisions. Moreover, the study adheres to IS 456:2000 standards regarding minimum and maximum reinforcement in both tension and compression zones, along with spacing requirements for stirrups. In the analysis, a grade of concrete M30 and steel grades FE415, FE500, and FE550 are considered. The FE analysis is conducted under two-point loading conditions. The outcome of the analysis yields an empirical formula for the modulus of elasticity specific to the grade of steel and concrete under examination.

Keywords: Doubly reinforced concrete beams, Modulus of elasticity, Grade of concrete, Grade of steel, Under Reinforced beams.

SMPARCE2024_STR_010

Non-linear Analysis of Reinforced Concrete Skew Slabs using Finite Element Method

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Abstract. Sloped slabs a small environmental footprint in the construction of new roads. Therefore, analyzing skew slabs bridges is more challenging compared to analyzing right-angled bridges. The main goal this is project focuses on conducting non-linear analysis reinforced concrete skew slabs. It is important to examine the impact of deflection I skew slabs since the sides are nit at right angles. The analysis of skew slabs was conducted using ANSYS software version R.22.1. O determines the most successful reinforcement structure in a biased scenario. The researchers examined slabs, deformation, and stress and strain behaviour. By analyzing the data for experimental deformation in 'I a titled slab, the most noticeable pattern will be seen in the patterns with the highest deflection values in the solutions. Upon examination, the conduct of various individuals for identifying the effective reinforcement pattern in skew slabs, deformation, stress, strain behaviour was studied. By comparing the data for experimental deflection in skew slabs, the effective pattern will be observed in pattern having maximum deflection values in solution. On analysis, the behaviour of different deflection pattern for designed skew slabs is studied using ANSYS (R.22.1) skew slabs contribute to minimal environmental impact for recent road construction projects. Thus, it is difficult to analyses the skew slabs bridges than the right-angled bridges. The primary objective of this project is "Non-linear analysis of reinforced cement concrete skew slabs. For skew slabs, the sides are not orthogonal and so it is a matter of interest to study the effect of deflection in the slabs. ANSYS (R.22.1) software was used for the analysis of skew slabs.

Keywords: Reinforced cement concrete skew slabs skew angles, fixed support deflection, finite element analysis, ANSYS.

SMPARCE2024_STR_011

Strengthening RCC Structures: Maximizing Earthquake Resistance by including Bracing and Shear Wall

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Abstract. This study looks at how strategically adding shear walls and bracing could strengthen Reinforced Concrete (RCC) structures at various building heights, from low-rise buildings to high-rise buildings. The

study looks into the ideal locations for shear walls and bracing inside buildings to lower seismic risk. Furthermore, in order to accurately depict building behavior, the usefulness of combining bracing and shear walls is examined. This paper aims to determine which strengthening system is most suited for seismic load resistance by assessing the impacts of several systems. ETABs v2020 software was used to do linear dynamic analysis, also known as response spectrum analysis, in order to accomplish the required result, a total of 120 models were meticulously constructed and analyzed. Thorough analysis and comparison demonstrate that the use of bracing and shear walls yields better results in terms of reduced base shear and less storey drift when compared to standard building design.

Keywords: Story Drift, Base Shear, Displacement, Bracings, Shear Wall, Seismic Strength.

SMPARCE2024_STR_012

Fortifying RCC Frameworks: Incorporating friction dampers and bracing to optimize seismic resistance

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Abstract. Basically, in tall building Structures lateral loads i.e. earthquake and wind always effect the design. So, to overcome these loads and to meet design and serviceability requirements, an appropriate lateral loads resisting system must be employed. Systems such as friction dampers, X bracing, and diagonal bracing can be employed to meet lateral stiffness and strength requirements. In the present paper 6, 12, 18 Story reinforced concrete building has been modeled in ETABS 2020 for the purpose of study. Since a huge portion of society is supported by expanding infrastructure and these projects need significant financial outlays, it is imperative that they be made more earthquake-resistant and that people may have faith in them. Applications of structural response control are becoming more and more necessary globally. The use of friction dampers, one such device, for response control of buildings is discussed in this study along with its efficacy. A total of 33 models have been prepared and compared, bare frame, bracings and friction dampers. In order to accurately depict the reaction of the structure, equivalent static and linear response spectrum studies have also been carried out. Each model's base shear, drift, displacement, and story shear have been determined and compared with each other for seismic efficiency.

Keywords: Story Shear, Story Drift, Displacement, Bracings, Dampers, Seismic Resilience

SMPARCE2024_STR_013

Comparative Analysis of High-Rise RCC Building subjected to Blast Load

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Abstract. The purpose of comparative analysis of an explosion or blasting of TNT near a building or in the building can cause a disastrous damage to the building which can be internally or externally, this blast can cause minor to major damage to the building. The main aim of this project is to comparative response of a building model when subjected to blast using E-Tabs software. And the blast parameters are calculated using IS 4991-1968. In this study is 22 storey building with a different structural system is used to comparative

response of the building which is subjected to 100 and 200 kgs of TNT with 20 and 40 m stand of distance and analyse the response of the model in terms of story, displacement, and story drift to know the structural element that helps resist effect of the blast and to have a better understanding of explosives and characteristics of explosion will help us make blast resistant building much more efficiently.

Keywords: Blast; E-Tabs; IS 4991-1968; Story Drift; Story Displacement

SMPARCE2024_STR_014

Comparative Analysis on Structural Form for Seismic Zone using Bracings & Shear Wall

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Abstract. The steel structure for the building industry has been a major contributor to the most helpful content in the world over the previous few decades. Providing the necessary stability, strength, and adaptability are the main goals of seismic design. It is necessary to design a structure under seismic loads. The system's structural bracing component has a significant impact on how the structure behaves during earthquakes. The worldwide seismic behaviour of a big steel-framed skyscraper can be altered by its bracing design. This study uses a 22 storey building model is taken as a case study with 3m height of each floor. The structure is analysed for earthquakes in seismic zone III using the E-tabs software, taking into account all soil conditions, including soft, medium, and Indian soil. A software program called ETABS SOFTWARE is used to analyse steel buildings and compares various factors. The section's property is utilized in accordance, which analyses different bracing kinds, including X bracing, diagonal bracing, shear wall and bracing-free. The performance of each frame is investigated and compared. In this study, the maximum lateral force was used to compare the bracing framed and for multistorey steel buildings.

Keywords: X Bracings, Shear Wall, Diagonal Bracing, E-Tabs, Comparative analysis, storey displacement, storey drift.

SMPARCE2024_STR_015

Effect of perlite powder on performance of bacterial Concrete

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Abstract. Perlite is the naturally occurring odourless, low-density substance whose main composition is silicon oxide (sio2) and other components like aluminium oxide (al2o3) etc. Perlite is available in coarse to fine particle size imparting variation in its strength depending upon the size of particles. The optimum level of perlite replacement is 15%. Bacterial concrete consists of microbial induced concrete in dormant spore suspension which has ability to remediate cracks by filling it with calcite and improving strength of concrete. Addition of Perlite powder provides various positive effects on structure like thermal insulation, noise reduction, fire resistance, increased workability and with the composition of bacterial concrete enhancement in flexural strength, compressive strength with self-healing ability of the structure can be obtained accelerating the performance and life of the structure.

Keywords: Perlite powder, Bacterial concrete, Silicon oxide, Aluminium oxide, Flexural strength, Compressive strength.

SMPARCE2024_STR_016

Evaluation of Strength Properties of Bacterial Concrete using Perlite Powder as Partial Cememt Replacement

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Abstract. Cement mortar is one of the widely used substance for construction which has the capacity to regain cracks about 0.2mm size, Self-mending concrete is made by blending micro-organisms which include seven types of bacteria those are Sporosarcina pasteurii, Bacillus sphaericus, Escherichia coli, Bacillus subtilis, Bacillus cohnii, Bacillus balodurans, Bacillus pseudofirmus that deliver limestone which has higher capacity to recover breaks. Perlite powder is a naturally occurring substance which is light in weight and provide various effects like increased density and compressive strength etc. whose chemical composition mainly consisting of silica (sio2) about 70-75% helping to obtain great quality concrete. Bacterial concrete has self-recovering capacity, repairing cracks up to 0.5mm thickness and its strength property is determined by variation in its compressive strength test, split tensile strength test and flexural strength test due to the addition of bacteria and perlite powder.
Keywords: Bacterial concrete, Perlite powder, Compressive strength, Split tensile test, Flexural test

SMPARCE2024_STR_017

Analysis Of Outrigger Structural System with Belt Truss Subjected to Lateral Force

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Abstract There are various challenges in designing high-rise structures. Various structural solutions have been designed to regulate the lateral movement of tall buildings. One of these solutions is the outrigger, which reduces the tension on the structure's foundation as well as the structure's horizontal displacement. However, the structure's efficiency is greatly impacted by the outriggers' placement. Optimizing outriggers is a major challenge. This thesis seeks to improve knowledge of outrigger placements and individual outrigger efficiency when several outriggers are employed in the structure and behavior of outriggers. Globally, the creation of tall buildings has been expanding quickly, posing new issues that call for engineering judgment.
Keywords: E-TABS, OUTRIGGERS, Principle of Outriggers.

SMPARCE2024_STR_018

Performance Based Seismic Design Of RC Framed Building Using Time History Method

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Abstract: The 'performance-based' seismic design has 2 key apprehensions: A) suitable estimate of the ambiguities that are connected with the performance & evaluation process & B) acceptable categorization of the related structural dent for the direct inclusion into the design or performance evaluation methodology. This learning endeavors to deal with these prime ambiguities by ascertaining the performance of a reinforced-

concrete frame by deploying 'non- linear static' procedure of analysis. For this, fifteen-floor 'moment-resisting' building is designed by adhering to the guide-lines of 'Indian seismic codes' by applying to various 'lateral load patterns'. The seismic response is ascertained in terms of 'fundamental periods'; displacements @ roof, 'inter-story drift', & also 'base shear' where compared with various recital limits. The achieved results are showed at the end of the report.

SMPARCE2024_STR_019

Analysis Of Reinforcement Cement Concrete Elevated Water Tank in SAP2000 Software

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Abstract: With the use of fluid viscous dampers (FVDs), the current study attempts to examine how elevated water tank staging behaves dynamically when ground vibrations are caused by blasts. The principal aim is to employ structural reaction control mechanisms to minimize harm to the elevated water tank. The elevated water tank is modeled using SAP2000, and the fluid viscous dampers' performance is assessed under four different blast-induced ground motion intensities using a non-linear time history analysis. The structure with fluid viscous dampers and the structure without dampers are compared. According to the analysis's findings, using fluid viscous dampers considerably lowers displacements, shear forces, and bending moments when compared to not using dampers. This work indicates that fluid viscous dampers are an efficient.

SMPARCE2024_STR_020

Experimental Investigation On Effect Of Carbon Fiber On The Flexural Performance Of Concrete Made With Optimum Sugar Cane Bagasse Ash

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Abstract: Sustainable construction has become increasingly crucial due to its damaging effects. Researchers are investigating new methods to reduce the carbon footprint and improve the longevity of concrete. To control demand and costs of concrete elements like cement and sand, alternative materials must be developed using industrial and agricultural waste. This paper present the trial for integrating Carbon fibers (CF) and sugarcane Bagasse ash (SCBA) into eco-friendly concrete composites. Various combinations were tested to assess their impact on compression test, split tensile strength test, and flexural strength.
Keywords: Sugarcane bagasse ash, Carbon fiber, Cement replacement.

SMPARCE2024_STR_021

Confinement Effect On Modulus Of Elasticity Of RCC Beam

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Abstract: Concrete, as a non-elastic material with a non-linear stress-strain curve, challenges the application of traditional elastic constants like Poisson's ratio and modulus of elasticity. Despite this discrepancy, these

constants are commonly utilized in the design process to simplify the analysis of concrete structures. The modulus of elasticity of concrete plays a crucial role in predicting building deformation and determining the modular ratio, even though the material's actual behavior deviates from ideal elastic assumptions. This abstract underscores the significance of the modulus of elasticity in estimating structural deformation and highlights the practical use of elastic constants in concrete engineering, acknowledging the complexities of material behavior versus theoretical assumptions.

Keywords: Cement, fine aggregate , coarse aggregate , steel FE550,mould`,Compressive strength, Cement replacement Etc

SMPARCE2024_CTM_001

Analysis of Delays in Commercial Construction Project

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Abstract. Large construction projects often face delays, which can result in the client receiving the finished product later than expected and can also have a significant impact on the project's cost, schedule, and quality. Delays often lead to strained relationships, mistrust, and uncertainty among the parties involved, which can be very disruptive. This study aimed to identify the main causes of industrial project delays in India and compare the findings with global experiences. Qualitative and quantitative data were collected through a survey conducted via questionnaires and in-person interviews with construction managers and site managers who have worked on major building projects for at least ten years.". The fact that geological examinations do not always forecast the condition of the entire site is one important element that frequently arises: "unforeseen ground conditions." All of the participants agreed that "lack of producing design documents on time, late instructions, and unclear and inadequate details on drawings" are the main ways that the design group causes construction delays. However, because of the limited sample size, these results cannot be generalized. As a result, a large-scale empirical study is recommended, with surveys of clients as well as other members of the project team, in addition to construction managers.

Keywords: Glass powder, fly ash, compressive strength, split tensile strength.

SMPARCE2024_CTM_002

Performance studies on Recycled Aggregate based Self Compacting Concrete (SCC)

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Abstract. Self-Compacting Concrete (SCC) is a type of fresh concrete which flows under its own weight and doesn’t require any external vibration for compaction and has revolutionized concrete placement. The paper deals with the comparison of the fresh and hardened properties of the self-compacting concrete SCC by replacing natural coarse aggregate with recycled aggregate at replacement level of 0%, 20%, 40%, 60%, 80% and 100%. Fresh Properties of self-compacting concrete includes slump flow and V-funnel time is measured to assess the workability. Compressive strength, Tensile strength test will help in finding the optimum dosage of the recycled aggregate and conducting the durability test for the optimum dosage which will provide result of high strength and durable concrete of recycle aggregate replaced with natural aggregate.

Keywords: Recycled coarse aggregate; Self-compacting; Demolition waste; Compressive Strength; Split tensile.

SMPARCE2024_CTM_003

Transparent Concrete: An Experimental Study using Rice Husk Ash and Gass Optical Fiber

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Abstract. In this dissertation there would be an exploration of an innovative concept of transparent concrete with incorporation of glass optical fibres and rice husk ash. This innovative material would be used as building material that has light-transmissive properties. The main aim of this research is to use natural sunlight as source of light for illumination purpose that reduce consumption of energy. To achieve this aim a study would be conducted to examines the integration of rice husk ash as a partial replacement for cement that would enhance the compressive strength and sustainability. In 2001, the idea of translucent concrete was first conceptualized by Hungarian architect Aron Losonzi and realized with the creation of Litracon in 2003. This material allows light to pass through due to embedded optical fibers that span the entire length of the concrete block, offering unique aesthetic and functional benefits for architectural applications. The study investigates the mechanical properties of translucent concrete incorporating rice husk ash, an agricultural by-product rich in amorphous silica and alumina, which is highly pozzolanic and enhances concrete strength. The research objectives include evaluating the compressive strength of transparent concrete with RHA, assessing light transmittance properties through illumination tests, and measuring natural sunlight transmission in dark environments. The idea was adopted on reviewing several literature covers various studies on transparent concrete, highlighting its development, applications, and advantages. To achieve objective of research methodology involves a systematic approach by reviewing relevant literature, selecting and testing materials, preparing mix designs, casting and curing concrete specimens, and conducting comprehensive tests to analyze results.
In conclusion this research will find the potential of integrating rice husk ash and optical fibers in transparent concrete, paving the way for eco-friendly, energy-efficient, and aesthetically pleasing construction materials that may used for future constructions.
Keywords: Castellated steel beam, Lateral torsional buckling, Tapered Section.

SMPARCE2024_CTM_004

Experimental Study on Load Deflection Behavior of Concrete Beams using Light Weight Aggregate

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Abstract. Concrete is one of the major component in the construction industry , and one of the major drawback of the conventional concrete is its self weight . This paper describes the characteristics of the light weight concrete using pumice stone as a light weight aggregate , the natural coarse aggregate are replaced by the LWA , which reduces the density of the concrete and also reduces the self weight of concrete .This study presented an experimental investigation on using light weight aggregate in concrete beam to reduce the seismic damages by reducing the self weight of structure . Pumice is a light weight stone commonly occurred in volcanic regions , with very less specific gravity , high porosity and higher water absorption . The advantage of using the LWA is to reduce the dead weight , quicker construction and low cost with more insulation capacity . The aim of this research is to obtain load deflection behavior of the light weight Reinforced concrete beams with optimum compressive strength . The conventional concrete and the LWA replaced concrete is

made by M30 mix and M50 mix and various mechanical tests like compression , split tensile , modulus of rupture and flexural capacity are tested and results are compared.

Keywords: Light weight concrete , Pumice stone , Reinforced concrete beams , Flexural strength , modulus of rupture , split tensile strength.

SMPARCE2024_CTM_005

Managing schedule progress using Primavera P6 and GIS

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Abstract. The integration of Primavera and Geographic Information Systems (GIS) offers a powerful approach for managing schedule progress in construction projects. This study explores the synergy between these two advanced technologies to enhance project planning, monitoring, and control. Primavera's robust project management capabilities, combined with GIS's spatial analysis and visualization tools, provide a comprehensive framework for real-time tracking of construction activities, resource allocation, and site conditions. The research demonstrates how this integration facilitates better decision-making, improves accuracy in progress reporting, and enhances communication among stakeholders. By conducting case studies and employing both qualitative and quantitative methods, the study validates the effectiveness of this integrated approach in various construction scenarios. The findings highlight the potential of leveraging Primavera and GIS to optimize schedule management, reduce delays, and increase overall project efficiency, offering valuable insights for industry professionals and contributing to the advancement of construction project management practices.

Keywords: managing schedule progress, project planning, monitoring, control, efficiency

SMPARCE2024_CTM_006

Analysis of Cost Overrun in Construction Project in Nepal

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Abstract. Cost overrun is one of the problems faced by most construction projects in Nepal. The unexpected budget in cost overrun can raise many problems in the project. Hence, it is important for every stakeholder in the project to have a good understanding of the factors causing cost overrun to avoid or to minimize the risk of it in the project. The aims of this study are to identify factors causing cost overrun in a project and to analyze factors that most influence the occurrence of cost overrun in construction projects in Nepal as perceived by the owner and contractor. This research used a questionnaire to collect data. 10 factors were identified in this research i.e poor project planning and scheduling; Inaccurate cost estimate; delays in projects schedule; project scope; lack of skilled labour; lack of technology; material price fluctuations; unforeseen site condition; political instability; natural disaster; inflation and economic factors. The main objective of this study is to finding the solution for set of problems obtained from the investigation by using SPSS software. Thus, identification of major factors is important to know the severity and then give suitable solution is the purpose.

Keywords: Cost overrun in construction; Project Planning; Cost Estimation; Relative Importance Index; SPSS Software; Nepal.

SMPARCE2024_CTM_007

Reducing The Cost Overrun of Construction Project

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Abstract. The high costs associated with commercial construction projects present a formidable challenge, impacting profitability, project feasibility, and stakeholder satisfaction. These costs arise from diverse factors including material price fluctuations, labour expenses, stringent regulatory requirements, and unforeseen delays, necessitating proactive measures to manage and reduce expenses. Primavera P6, a leading project management software, emerges as a pivotal tool in addressing these challenges through its advanced features. Studies leveraging Primavera P6 for cost reduction in commercial construction projects have demonstrated tangible benefits, including improved project efficiency, tighter budget control, and increased profitability. By leveraging its capabilities for comprehensive planning, efficient resource management, proactive risk mitigation, real-time monitoring, and enhanced collaboration, construction firms can effectively navigate cost challenges, deliver projects within budgetary constraints, and achieve sustainable success in a competitive market. In summary, Primavera P6 stands as a strategic ally in the pursuit of cost-effective commercial construction projects, offering a structured approach to mitigate risks, optimize resources, and enhance project outcomes while meeting stringent quality standards and client expectations.

SMPARCE2024_CTM_008

Analysing Risks involved in a Home Decor Project using Primavera Software

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Abstract. Risks are uncertain events that can impact the project's success or outcome. All endeavours involve some level of risks, no task is completely risk free. Interior designing is one such field that is particularly vulnerable to risks. The Interior design projects usually experience the following risks: lack of labourers at site, material unavailability, Delayed delivery of materials, Design and drafting flaws and many more. Presence of Risks leads to wide range of consequences, it results in delay, Cost overrun, Budget overrun, Quality issues and other negative impacts. To effectively mitigate risks, a thorough risk analysis and risk management strategy must be implemented. In this paper, different risks involved in a home decor project is identified and analysed using Primavera risk analysis software, this software helps to model the risks and analyse the cost and schedule impacts on project. For a home interior project, Complete Schedule is created with calendars, durations and relationships being assigned. Different risks associated with the project are noted, A brief survey was sent to professionals to gather insights on how different risks impact the project. Based upon the type of risk probability, effect of risk on schedule and cost is rated after which the software provides the risk score. This approach helps us to prioritize risks based on their severity and efficient risk mitigation steps are taken to minimize or eliminate the impact of risk.

SMPARCE2024_CTM_009

Analysing Delays in Construction Project on Residential Building

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Abstract. The construction industry in India has experienced significant growth and transformation in recent years. Effective construction management is crucial for project success in this rapidly expanding industry. This research explores the history, current status, challenges, and opportunities of construction management in India. It aims to develop strategies for sustainable growth and development by addressing issues such as delays, cost changes. Additionally, this research examines the role of Primavera P6, a popular project management software, in planning and scheduling construction projects. The study highlights the significance of delay analysis in construction and discusses various methods used to identify and analyze project delays. The research aims to evaluate the causes and consequences of project delays in the Indian construction industry, providing insights into effective strategies for minimizing delays and improving project outcomes. The findings of this study will contribute to better decision-making, risk management, and enhanced project performance in the construction sector.

SMPARCE2024_CTM_010

Duration Reduction of Construction Project

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Abstract. Construction management is a field of civil engineering that focuses on the effective and efficient administration of construction projects. Functional utility, structural stability, economy, speed, and construction quality are all important aspects of construction management. Time and cost are the most critical things to consider when planning any building project. The goal of the project is to plan, schedule, and complete the project on time and under budget using the Primivera P6 software application. It is used to improve scheduling by introducing crashing crunches into the work planning process. This study will primarily help in the investigation of behavioural gains over time based on relative cost. In this project residential apartment is taken and uses project crashing and crunching techniques to optimise it of time and cost. This project is useful for conditions where time and money are constraint, making construction more cost effective.

SMPARCE2024_CTM_011

Key Performance Indicators (KPI) as Success Factors for Affordable Housing Projects

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Abstract. This study emphasizes how important a link there is between affordable housing project success and Key Performance Indicators (KPIs). KPIs are essential instruments for evaluating project performance as

well as acting as promoters of excellence in affordable housing developments. Therefore, understanding the critical elements affecting KPIs and their complex significance in the success of housing projects is essential for efficient real estate development. An extensive analysis was carried out in order to determine the key elements that impact KPIs in affordable housing projects. Employees connected to a variety of developers at different locations within the National Capital Region (NCR) were then given access to a well-structured, closed-ended questionnaire. Data was gathered from 100 respondents using a deliberate blend of stratified and snowball sampling procedures, and SPSS-25 was used to evaluate the valid inputs. Using structural equation modelling (SEM) and regression analysis, the main performance indicators were determined. Five different components were identified by the factor analysis, and these factors accounted for 70.121% of the variance that could be explained. Among these are funding of finances (16.8), quality of construction (13.5%), government and regulatory compliance (15.6%), innovative design and technology (11.7%), and affordability and accessibility (13.7%). Government Compliance, Capital Funding, and Affordability & Accessibility were found to be the main key performance variables affecting the success of housing projects, according to PLS-SEM research. Additionally, the study examined how KPIs affect housing project success. Based on the data, there is a substantial connection (β=0.54, P=0.000) indicating that KPIs are important in determining how well housing projects work. To sum up, this research not only pinpoints the crucial elements affecting KPIs but also emphasizes their significant influence on the overall achievement of affordable housing projects.
Keywords: Government and regulatory compliance, funding of finances, innovative design and technology, high-quality construction, and key performance indicators.

SMPARCE2024_CTM_012

Impact of Mental Health and Wellness on Construction Worker's Productivity and Safety

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Abstract. The mental well-being of construction workers is a critical component that influences the safety and success of construction projects. This research paper examines the demanding nature of construction work, characterized by tight deadlines, long hours, strenuous physical labor, and potential hazards, which collectively contribute to heightened stress, anxiety, and depression among workers. The study explores the direct correlation between mental health issues and decreased productivity, highlighting how anxiety and depression can impair concentration, decision-making, and motivation, leading to errors, delays, and reduced output. Additionally, the paper discusses how mental health struggles can disrupt communication and teamwork, causing friction and collaboration challenges within the workforce. More alarmingly, the research underscores the connection between poor mental health and increased safety incidents, as workers under significant mental strain are more likely to engage in risky behaviours and overlook safety protocols. The findings emphasize construction companies need to prioritize mental health by creating supportive work environments, promoting healthy coping mechanisms, and providing accessible mental health resources. Fostering mental well-being is not just a humanitarian effort but a strategic investment in enhancing the safety and efficiency of construction operations.
Keywords: Mental Health, Construction Workers, Productivity, Safety, Stress Management

SMPARCE2024_CTM_013

Performance Studies on Recycled Concrete Aggregate Based Self-Curing Concrete

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Abstract. In the current scenario, advanced research in civil engineering is all about adopting sustainable solutions to reduce the impact on environment and consumption of resources. Out of various unexplored options of sustainable solutions, incorporating recycled concrete aggregate (RCA) seems to be a promising approach in developing self-curing concrete. Curing has been one of the important features to be adopted during the construction process to ensure the strength and integrity of the structure. In recent days, various types of curing methods have been adopted, of which self-curing or the internal curing is now well known to all. This study investigates the performance characteristics of self-curing concrete, partially incorporated with RCA replacing natural aggregates. Self-Curing Concrete engages the curing agents to retain the water in the concrete to support the hydration process, thus improving the mechanical and durability properties of the concrete. Incorporation of RCA aims at resemblance of challenges like resource conservation and waste management. Using curing agents like polyethylene glycol (PEG), a hydrophilic compound, helps in even more retention of water, thus reducing the chances of escape of pore water from the concrete. The study also includes the use of PEG 400 and PEG 4000 as curing agents for reference and will investigate their impact on the concrete in comparison to the conventional concrete. The main aim of the study is to figure out the optimum dosages of both RCA and curing agents to ensure an appropriate mix proportion and to conduct various long-term assessments on the concrete under various environmental conditions. Various research has been evident that the RCA based self-curing concrete have sometimes shown significant results in terms of strength and durability way outmatching the conventional concrete. Thus, RCA based self-curing concrete can be used as an sustainable alternative to empower the advanced research and development practices of civil engineering society.

Keywords: Recycled Concrete Aggregate, Polyethylene Glycol, Self-Curing Concrete, Hydrophilic Compound

SMPARCE2024_CTM_014

Effect of Mechanical Properties on Self-healing Concrete (Mixture of Recycled aggregate, Fly ash and Polypropylene fibre)

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Abstract. Self-healing concrete is an innovative material that helps to address the issue of cracks developed in concrete. If the cracks are left unattended it could lead to significant structural damage and costly repairs. The surge in demand for face masks due to covid is threatening the environment because of improper waste management therefore, a multi-disciplinary approach is required to reduce the environmental risk associated with disposal of used face mask. Recycled aggregate with specific proportion of 30% throughout the concrete mixes in modified samples will be replaced with natural aggregate. So, the aim of this study is not only to propose an approach to effectively recycle industrial and medical waste but also to identify the impact of integrated materials on mechanical properties of concrete and to examine the feasibility of incorporating surgical facemask, which is Polypropylene based material used as fibre, fly ash and recycle aggregate with self-healing bacteria in concrete. The first stage is to prepare conventional concrete samples to create a base

line. The second stage is to prepare modified concrete with different mixes with varying percentages by integrated fly ash, recycled aggregate and surgical mask in self-healing concrete to determine the optimal proportion of the incorporated materials. Therefore, this study also explores a sustainable way to reduce waste by recycling and reutilizing it in concrete construction.

Keywords: Self-healing Concrete, Recycled Aggregate, Polypropylene Fibres, Fly Ash.

SMPARCE2024_CTM_015

Experimental Investigation of High Strength Fibre Reinforced Concrete

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Abstract. In this study, we are going to have a brief knowledge on the high strength fibre reinforced concrete. Fibre reinforced concrete reduces the air voids and water voids. It increases the durability of the concrete and has better mechanical properties, high-temperature and corrosion resistance. The production of basalt fibre does not create environmental waste. Material used is Fine Aggregate, Coarse Aggregate 20mm down and cement grade 53 and chemical admixture 1 to 2% . The basic tests are conducted for all the materials used. Silica fume and fly ash are replaced with cement the following percentages are Fly Ash 5%, 10%, 15%, 20%, 25%. Silica Fume 5%, 7.5%, 10%, 12.5%, 15% The mix design referred is M70. The tests conducted are compressive Strength test, Split Tensile Strength after partial replacement of silica fume and fly ash.

Keywords: Silica Fume, Fly Ash, Basalt fibre, Compressive Strength Test, Split Tensile Strength Test

SMPARCE2024_CTM_016

Performance Study of Durability Characteristics of Light Weight Concrete

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Abstract. This project mainly focus on study on special concrete that is light weight concrete, this paper focus on comparative study of light weight concrete with the nominal concrete. As the nominal concrete as more dead weight, in order to reduce the weight of the concrete, the experiment is done by replacing the coarse aggregate of weight 1400 to 1600 kg per cum by pumice aggregate which as formed during the solidification of molten lava and has weight of 1200kg per cum to 1450kg per cum. in this project the study of light weight concrete is done by partial replacement of coarse aggregate with the pumice aggregate by the percentage 20%,40%,60%,80%,100% for M30 and M50 mix design. the strength and durability behavior of the partially replaced concrete is studied and compared with the normal concrete. Application of light weight concrete are used in high rise non load bearing walls and also used in earthquake resistant building. As the light weight concrete as comparatively less dead load can be used in foundation of the structure in order to reduce the weight of the concrete. The strength of light weight concrete is checked by conducting characteristics compressive strength under compression testing machine. The durability test carried out is acid resistance test, the test is carried out by drying the cubes after 28 days of normal curing, after the curing the dimension and weight of the cubes are taken and immersed the same cubes with water diluting with 5% of sulfuric acid for 28 days , measurement and weight will be taken after 28 days of acid curing and compared.

Keywords: light weight concrete, pumice aggregate, durability, compressive strength, acid resistance tests, non- load bearing walls.

SMPARCE2024_CTM_017

Study on Mechanical Properties of Coarse Plastic Aggregate incorporated in Concrete

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Abstract. The aim of this work is to investigate the mechanical properties of composite concrete using plastic waste as a partial replacement for coarse aggregate and silica fume as a partial replacement for cement. For this purpose, mixes with a constant water-cement ratio of 0.45 are preferred. Silica fume contents of 5%, 10% and 15% are replaced for cement. Plastic waste (Polypropylene) is used as partial coarse aggregate and replacement percentages are 5%, 10%, 15% and 20%. Compressive, flexural, and split tensile strengths of concrete are tested after 7 days and 28 days of curing. It is observed optimized silica fume and plastic aggregate are 15% and 10 % respectively for all mixes. Increase in plastic content reduces strength of concrete. However, increase in silica fume enhanced strength even in presence of plastic aggregate. Highest compressive strength is observed in the mix developed with 15% silica fume replacement for cement and 0% plastic aggregate. And optimized mix for composite concrete is the mix developed with 15% silica fume replacement for cement and 10% plastic aggregate. Strength obtained in optimized mix for composite concrete is only 15% lower compared to strength obtained in mix developed with 15% silica fume replaced concrete. Strength reduced linearly in all mixes due to the weakest interfacial transaction zone formed by plastic aggregate in composite concretes. It is also observed that silica fume helps in enhancing the strength by filling voids in ITZ even in presence of plastic aggregate. Hence it is recommended from this work to limit plastic content usage to 10% in concrete in combination of silica fume.

Keywords: Silica fume, plastic aggregates, chemical admixture, material properties, hardened concrete properties.

SMPARCE2024_CTM_018

Development Of Eco-Friendly Bricks Using GGBS And Zeolite

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Abstract. This Report represents the findings of investigation carried out on Geopolymer based bricks using Ground Granulated Blast Furnace Slag (GGBS), Zeolite, M-Sand, Sodium Hydroxide as an alkaline activator. Bricks were casted using manually compacting by mixing GGBS, Zeolite, M-Sand and Sodium hydroxide for different Molar Concentration of Sodium hydroxide solution, by varying percentage of GGBS with Zeolite. The bricks were then tested with Compressive strength, Ultrasonic pulse velocity (UPV), Flexure strength, Water absorption test, Thermal conductivity test, Density test, Soundness test, Dimensionality test. The results showed better performance compared to conventional clay bricks and concrete blocks were observed. Compressive strength ranges between 3.31MPa to 7.2 MPa for 3days, while UPV ranged from 2000 m/s to 3500 m/s. Increase in percentage of Zeolite as an alternative binding material for GGBS reduces the density and increases the ultrasonic pulse velocity. Test for UPV shows that the bricks have undergone Geopolymerisation. The optimum ratio of GGBS, Zeolite, M-Sand & Sodium hydroxide was found to be 2:1 for better performance when compared with other proportions. As the molar concentration of sodium hydroxide increases correspondingly compressive strength also increases. It can be concluded that bricks developed in this study can be used as an alternative to conventional clay bricks.

Key Words: Ground Granulated Blast Furnace Slag (GGBS), Zeolite, M-Sand, Alkali Activator Solution (NAOH).

SMPARCE2024_CTM_019

Critical Project Management Factors In Delivering Green Building Project

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Abstract. The concept of green building has been scaling from small houses to big offices and skyscrapers around the globe. Some international certifications have been developed in order to provide clear guidelines on how to do it. The U.S. Green Building Council (USGBC) developed the Leadership in Energy and Environmental Design (known as LEED) to rate green buildings. Another popular certification is the Building Research Establishment Environmental Assessment Method from the U.K. Also known as BREEAM. Due to the negative environmental impacts of traditional buildings, green building methods has attracted more interest in recent years. Management is believed to be the factor that most often determines the success or failure of a project. Management activities in green building can be better understood by exploring the critical success factors (CSFs) for improving the environmental performance of building projects. Developing country with limited resources like India is giving importance to sustainability in construction projects. Most managers do not have much experience in managing these projects yet. They are not fully aware of the importance of project management factors which can significantly affect the delivery process of GBPs. The main objective of this study is to identify the major project management factors required to deliver GBPs successfully in India.

SMPARCE2024_CTM_020

Performance study on Light-Weight Aggregate Concrete using Pumice Stone by Microstructural Tests

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Abstract. The depletion of natural aggregates has become a major issue and henceforth the evolution new materials are taking place. In this study we are going to have a brief knowledge on the microstructural analysis of light weight aggregate concrete. The coarse aggregate is replaced with pumice stone. Light weight aggregates come in place to reduce the dead load of concrete when it is used for non-load bearing walls. Materials used for light-weight aggregate concrete are cement grade 53, fine aggregate as M-sand, coarse aggregate 20 mm down and pumice stone with admixtures. The basic tests are conducted for all the materials used. Pumice stone are replaced with coarse aggregates the following percentages 0% ,20% ,40% ,60% ,80% ,100%. The mix design referred are M30 and M50. The main aspect of this experiment is to find out the optimal percentage The main purpose of using light weight aggregate concrete is to reduce the dead load which are feasible in using foundation works. Another application of using pumice as replacement is, it can be used in High rise non-load bearing walls and earth-quake resistance buildings. The microstructural analysis of the light weight aggregate concrete helps to better understand the detailing of the concrete structure. Tests conducted under microstructural analysis are SEM, XRD, and EDX.
Keywords: Pumice stone, light weight concrete, Scanning Electron Microscopy (SEM), Xray Diffraction (XRD) , Energy Dispersive Xray(EDX).

SMPARCE2024_CTM_021

Reducing Cost and Time using Value Engineering

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Abstract. Value engineering concentrates on the effectiveness through stating functions, goals, needs, requirements and desires. Using value engineering methods by multidisciplinary team, value and economy are improved through study of alternative design concepts, material and construction methods without compromising functional requirement and quality. In this research, we are going to study value engineering and its implementation in construction industry. Also To compare projects cost and time schedule after application of value engineering. We have also found results on these objectives and it is found that value engineering can be successfully applied on the commercial sites that we have selected.
Keywords: Value Engineering, Commercial building, Time and Cost Analysis.

SMPARCE2024_CTM_022

Investigation On Strength and Durability Characteristics of Coconut Fiber Reinforced Concrete

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Abstract. The growing need for sustainable construction materials has driven significant interest in natural fibers as reinforcement in concrete. This study investigates the strength and durability characteristics of coconut fiber reinforced concrete (CFRC). Coconut fibers, an abundant agricultural waste product, offer a promising eco-friendly alternative to synthetic fibers due to their high tensile strength, durability, and availability. This research aims to evaluate the mechanical properties of CFRC, including compressive strength, tensile strength, and flexural strength. Additionally, the durability aspects, such as resistance to cracking, water absorption, and long-term performance under various environmental conditions, are assessed. Different mix proportions with varying fiber content are prepared and tested to determine the optimal blend for enhanced performance. Preliminary results indicate that the inclusion of coconut fibers improves the tensile and flexural strength of concrete while maintaining adequate compressive strength. Moreover, the fibers contribute to better crack resistance and reduced water permeability, suggesting enhanced durability. The study concludes that coconut fiber reinforced concrete is a viable material for sustainable construction, offering a balance between strength, durability, and environmental benefits. These findings provide a foundation for further research and potential applications in construction, promoting the use of natural fibers in concrete to reduce environmental impact and improve material performance.

SMPARCE2024_TEM_001

Modelling Of Metro Performance: A Case Study In Bangalore City Metro

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Abstract. The creation of an all-encompassing model for assessing metro system performance is the main goal of this project. The model attempts to offer a comprehensive evaluation of metro efficiency by

incorporating important operational parameters like frequency, service reliability and sixteen more parameters. The suggested approach provides predicted insights for enhancing operations and identifies crucial elements impacting performance through the use of SEM (structural equation modelling) and PCA (principal component analysis). The results of this study can help transit authorities and urban planners in metro systems by decreasing delays, raising overall passenger satisfaction, and boosting service quality.

Keywords: SEM (structural equation modelling), PCA (principal component analysis).

SMPARCE2024_TEM_002

Evaluating Safe and Sustainable Bicycle Sharing Systems in Urban India: A Case Study of Bengaluru

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Abstract. This paper aims to explore the factors influencing the adoption of Public Bicycle Sharing Systems (PBSS) in urban India, with a focus on Bengaluru. By examining the current usage, public perceptions, and infrastructure challenges, the study provides insights into how PBSS can be made more efficient and inclusive. The research employs a combination of questionnaire surveys, data analysis, and modeling techniques to evaluate the system's performance and propose recommendations for future improvements.

Keywords: Sustainable Transport, Urban Mobility, Cycling Infrastructure, Active Mobility, SEM (Structural Equation Modelling), PCA (Principal Component Analysis), EFA (Exploratoray Factor Analysis).

SMPARCE2024_TEM_003

Laboratory Investigation of Alkali Activated Slag Concrete using Reclaimed Asphalt Pavement (RAP)

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Abstract. A Reclaimed asphalt pavement (RAP) aggregate with thin bituminous film surfaces is the primary reason for reduction in strength of concrete, which restricts to use RAP for a particular application. The current study aims to develop the Alkali Activated Slag Concrete (AASC) with RAP as an alternative to natural aggregates (at 100% replacement level). A total of 11 AASC mixes were developed and tested herein. These blends were isolated into three groups, with steady alkali to binder ratio 0.35, sodium hydroxide concentration of 8M, 10M and 12M and sodium silicate to sodium hydroxide ratio of 1, 1.5 and 2 based on the bitumen percentage determined from centrifuge extractor. Two control mixes were cast for comparative study prepared with 100% natural aggregates. Physical and mechanical properties of RAP induced AASC mixtures are analyzed in terms of slump, compression, split tensile and flexural strength, modulus of elasticity, flexural-fatigue analysis and micro-structural analysis. It was discovered that concrete mixes 100% RAP, concrete properties remained unaffected by the binder content and activator concentration. Utilization of 100% RAP content in AASC mixes developed strength comparable to control mixes.

Keywords: RAP; AASC; SH; SS/SH ratio.

SMPARCE2024_TEM_004

Performance Assessment of Robo Sand in Enhancing the Behavior of Expansive Subgrade

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Abstract. This experimental exploration on the influence of Robo sand(stone powder), in improving the performance of expansive subgrade soils needs an important problem statement for civil engineers. The expansion of expansive soils when they absorb moisture can lead to major problems for infrastructure. Robo sand is a by-product of stone quarries while aggregate production and therefore cracks the most beneficial potential soil stabilizer with miniaturized details in India. This study examines the effect of Robo sand on the engineering properties of expansive subgrade soils using laboratory experiments and field tests. Some of the key parameter such as Swell potential, The efficiency of Robo sand in the study of reducing soil expansion and increasing load-bearing capacity is determined by conducting California Bearing Ratio (CBR) test, (UCS) Unconfined compressive strength parameters. The results intended to enable further understanding of Relative growth and thus utilization at site level for both as a sustainable solution to the stabilisation expansive subgrade soils in the field of road construction.
Keywords: Robo sand, expansive soils, subgrade stabilization; swell potential; California Bearing Ratio (CBR); Unconfined compressive strength (UCS).

SMPARCE2024_TEM_005

Geotechnical Behaviour of Xanthan Gum Treated Micecous Soil

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Abstract. Micaceous soil is a problematic soil due to its low strength and poor ductility. Micaceous soils are common in many tropical countries and regions and in some locations with moderate climates. The soils are spongy and unstable when loaded and are not considered suitable as construction material in earthen structures. To resolve this issue, the Micaceous soil is treated with Xanthan gum. Xanthan gum is used in the range of 0.5%, 1%, 1.5%, 2%, 2.5%, and 3%. specimens are cast by adding polymers to micaceous soil to determine the geotechnical properties such as specific gravity, liquid limit, plastic limit, CBR, and compaction factor by the standard procotor method. A total of 90 sample were prepared at various dosages. Unconfined compression tests were conducted on the samples cured for 7 days, 14 days, 28 days, and 56 days, respectively.
Keywords: Micaceous soil, Xanthan gum, UCS

SMPARCE2024_TEM_006

Geotechnical Behaviour of Lime Treated Micecous Soil

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Abstract. Micaceous soil poses challenges due to its low strength and poor ductility, making it unsuitable for earthen constructions in tropical and moderate climate regions. To tackle these issues, a study was conducted to enhance micaceous soil by incorporating quicklime. A total of seventy five samples were prepared with varying amounts of quicklime, ranging from 2% to 8% by weight. After curing periods of 7, 14, 28, and 56 days, unconfined compression tests were conducted to assess the soil's performance. The results showed that the addition of quicklime significantly improved the soil's properties, demonstrating its potential to mitigate the soil's instability and enhance its load-bearing capacity.
Keywords: Micaceous soil, Lime, Unconfined compression test (UCS).

SMPARCE2024_TEM_007

Sustainable Urban Transformation: A Detailed Study on Sustainable Approaches to Mitigate Urban Traffic Pollution

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Abstract. This review article thoroughly examines the dynamics of urban transformation, focusing on the intricate interplay between emerging technologies, sustainable urban mobility trends, and future policy developments. The analysis highlights the potential of technologies such as autonomous vehicles, hyperloop systems, and urban air mobility to revolutionize urban transportation. By exploring sustainable urban mobility trends, the article emphasizes the need for inclusive, accessible, and eco-friendly transportation solutions, including micro-mobility options, data-driven decision-making, and smart infrastructure. Anticipated policy and governance developments indicate a transformative era, with governments committing to strict emission reduction targets, promoting sustainable practices, and encouraging public-private partnerships. The implications drawn from this analysis underscore the significant impact of technological, societal, and policy changes on urban transformation. The abstract concludes with a call to action, urging governments, city planners, businesses, and citizens to prioritize investments in emerging technologies, sustainable infrastructure, and comprehensive policy frameworks. By adopting a holistic, integrated approach that considers the interplay of technology, societal behaviour, and governance structures, urban areas can achieve a transformation aligned with sustainability, resilience, and an improved quality of life. This abstract captures the essence of the comprehensive review, offering a roadmap for navigating the complexities of urban transformation in the 21st century.
Keywords: Urban Transformation, Sustainable Mobility, Emerging Technologies, Policy Governance, Future Development, Inclusive Transportation.

SMPARCE2024_TEM_008

Laboratory Investigation on Semi Flexible Pavement with Reclaimed Asphalt Material

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Abstract. Semi-Flexible Asphalt (SFA) mixture is a wearing course in which Open-Graded Asphalt (OGA) mixes having air voids of 20–35% are grouted with cement mortar. In this study, the performance of semi flexible pavement with Reclaimed Asphalt Pavement (RAP) was evaluated, in terms of their Marshall stability, flow, and volumetric properties, compressive strength, Indirect Tensile Strength, Cantabro loss, fatigue resistance, moisture and Oil spillage to verify their applicability as a replacement for the natural aggregate in the flexible pavement surface layers of HMA mixtures. The grouting method is adopted to fill the voids in OGA mixes, the grout consists of cement, M-sand, superplasticizer, and water. Initially, an effort was made to assess the effect of the Sand-Cement (S/C) ratio in determining the optimal grout proportions. Taguchi method of optimization technique is used to obtain the optimal grout proportion. The experimental work was divided into two phases; the first phase investigated the optimization of grout the mixture prepared with an S/C ratio of 0.45, 0.5 and 0.6, a water-to-cement (W/C) ratio of 0.3, 0.35 and 0.40, and a Poly carboxylic either-based superplasticizer (SP) content of 0.55, 0.65 and 0.75% by weight of cement. The second phase investigated the effect of RAP material and bitumen type on the mechanical properties of SFA mixtures, a new aggregate gradation with neat and modified bitumen was used to prepare OGA mixtures and later grouted with optimal grout proportion.
Keywords: Reclaimed Asphalt Pavement (RAP), Marshall stability, flow, and volumetric properties, compressive strength, Indirect Tensile Strength.

SMPARCE2024_TEM_009

Experimental Study on the effect of Silica Fume as an additive on Recycled Asphalt pavement(RAP) in Cement Concrete

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Abstract. This paper presents the results of a study that investigated the improvement of the mechanical properties of coarse and fine recycled asphalt pavement (RAP) produced by adding silica fume (SF) with contents of 5%, 10%, and 15% by total weight of the cement. The coarse and fine natural aggregate (NA) were replaced by RAP with a replacement ratio of 10%, by the total weight of NA. In addition, SF was added to NA concrete mixes as a control for comparison. Twenty-eight mixes were produced and tested for compressive, splitting tensile, and flexural strength at the age of 28 days. The results show that the mechanical properties decrease as the content of RAP increases. The decrease in the compressive strength was more in the fine RAP mixes compared to the coarse RAP mixes, while the decrease in the splitting tensile and flexural strength was almost the same in both mixes. Furthermore, using SF enhances the mechanical properties of RAP mixes where the optimum content of SF was found to be 10%, and the mechanical properties enhancement of coarse RAP were better than fine RAP mixes. Accordingly, the RAP has the potential to be used in concrete pavements or in other low-strength construction applications in order to reduce the negative impact of RAP on the environment and human health.

Key Words: Reclaimed Asphalt Pavement (RAP), Marshall stability, flow, and volumetric properties, compressive strength, Indirect Tensile Strength.

SMPARCE2024_TEM_0010

Performance Of Nano Modified HMA Mixes Incorporating Rap

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Asphalt pavement plays a crucial role in transportation infrastructure, providing durability and smooth surfaces for roads, highways, and airports. Traditional Hot Mix Asphalt (HMA) has been standard but faces challenges regarding environmental impact and energy consumption. This has driven research into sustainable alternatives, including the integration of nanomaterials such as nano clay. Nano clay offers unique properties due to its small size and high surface area, which can effectively modify asphalt binders and mixtures at the molecular level. In HMA, nano clay improves mechanical strength, thermal stability, and rheological properties, enhancing resistance to rutting and fatigue cracking while extending pavement lifespan. This abstract explores the mechanisms behind nano clay's performance enhancements in asphalt pavements, highlighting its potential to revolutionize pavement technology towards sustainability and improved infrastructure longevity
Keywords: RAP, NANO CLAY

SMPARCE2024_TEM_0011

Selection and Evaluation of Alternative Routes as a Ring Road for Srinivaspura City Using MCDM Technique

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Abstract Traffic congestion is one of the most debilitating issues in cities, affecting society and the economy. So here is one of the same challenges plaguing the city called Srinivaspura Kolar district. The city is experiencing significant congestion during peak hours, and an excessive number of vehicles are entering the city unnecessarily to travel to other major cities such as Kolar, Mulubagilu, and Chintamani, as well as other major districts, we must travel within the city of Srinivaspura, which causes additional congestion. So, we are aiming to provide another alternate route or ring road to circumvent the city. To select the optimal alternative path, we use the Multi-Criteria Decision-Making Technique as a FUZZY TOPSIS (Technique for Order of Preference by Similarity to Ideal) weighted by analytic hierarchy process (AHP) the obtain results are align with the practical conditions.
Key Words: MCDM (multi-criteria decision making), AHP (analytic hierarchy process), FUZZY TOPSIS,

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