Sri Venkateswara College of Engineering

Department of Civil Engineering

PROCEEDINGS

National Conference
on
Smart and Energy Efficient Construction Materials and Technologies for Sustainable Infrastructure (SEMSI-2023)

Sponsored by

Science and Engineering Research Board (SERB)
New Delhi

16th & 17th February, 2023

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PREFACE

The Department of Civil Engineering, Sri Venkateswara College of Engineering, is proud to bring out the proceedings of the National Conference on **"Smart and Energy Efficient Construction Materials and Technologies for Sustainable Infrastructure (SEMSI-2023)".** in printed and PDF form. This conference is one of the most comprehensive Civil Engineering related conferences to take place in India. The conference was conducted on 16th -17th February 2023 at the Sri Venkateswara College of Engineering, Sriperumbudur.

SEMSI-2023 provide an excellent opportunity for the speakers/delegates to discuss and share their views on Smart construction materials and techniques, Sustainable Binders and Concrete, Sustainability and Life Cycle Assessment, IoT in Construction, Construction Automation, Artificial Intelligence in Construction sector, Nano-technology based cementitious material, Energy efficient building materials, etc. The purpose of this conference is to bring together leading academicians, scientists, PG students and research scholars to exchange and share their experiences and research outcomes on all aspects of Smart Construction Materials and Technologies. It also provides an interdisciplinary platform to present and discuss the latest innovations, trends, concerns and adoption of suitable solutions for the various practical challenges encountered in the fields of Smart Construction Materials and Technologies. The invited speakers are globally recognized experts in the respective fields viz., **Dr. S. Maheswaran,** Senior Principal Scientist, Advanced Materials Laboratory, SERC-CSIR, Chennai, **Dr. Mahendrakumar Madhavan**, Professor, Department of Civil Engineering, IIT Hyderabad, **Dr. S. Praveenkumar**, Assistant Professor (Sr. Grade), Department of Civil Engineering, PSG College of Technology, Coimbatore, **Dr. T. Palanisamy**, Assistant Professor Department of Civil Engineering, NITK, Surathkal, **Mr. Nagesh Puttaswamy**, Former DGM Technical Ultratech Cements Ltd. Independent Civil Engineering Professional Trainer, Mentor & Skill Enhancer**, Dr. J. S. Sudarsan**, Program Director, School of Energy & Environment. NICMAR University, Pune.

My sincere thanks to **Dr. S. Ganesh Vaidyanathan**, **Principal** and **Dr. M. Sivanandham**, **Secretary**, Sri Venkateswara College of Engineering for granting permission to apply for the grant from the SERB under Seminar/Symposia (SSY) scheme.

I would like to convey my sincere and heartfelt thanks to all the **Resource Persons** who have contributed for this Conference by sharing their expertise.

I am grateful to all the participants who showed interest and actively participated. I also thank them for all the positive feedback they have given. I thank all the **Department faculty and staff members** who helped in conduct of this program.

Above all, I am thankful to the God Almighty for the successful completion of the program.

Dr. R. Kumutha
Convener & Organizing Secretary

ABOUT THE COLLEGE

Sri Venkateswara College of Engineering (Autonomous), a premier self-financing engineering college was established in the year 1985 and is managed by Sri Venkateswara Educational and Health Trust. The college offers 12 B.E/B.Tech Degree Courses and 7 PG Courses in Engineering/ Technology. The courses are approved by AICTE and affiliated to Anna University, Chennai, The College attained autonomous status in the year 2016. The college is accredited by National Assessment and Accreditation Council (NAAC) with A+ Grade in the year 2022. The National Board of Accreditation has accredited many of the eligible programs. The college is an ISO 9001:2015 certified institution. The college is situated in serene environment about 37 Kms from Chennai and situated on the way of Chennai – Bangalore National Highway (NH4) at Pennalur, Sriperumbudur in Kanchipuram district.

ABOUT THE DEPARTMENT

The Department of Civil Engineering has started functioning from the year 2008, offering B.E. degree program in Civil Engineering. At present, the Department has 10 faculty members having P.G. specialization in different areas of Civil Engineering such as Structural Engineering, Transportation Engineering, Construction Planning & Management, Water Resources Engineering, Geotechnical Engineering & Environmental Engineering. The Department has excellent infrastructure in terms of well-established Laboratories and class room facilities. The Department has expertise and facilities for undertaking consultancy works on testing of building materials, traffic studies, structural analysis and design etc.

ABOUT THE CONFERENCE

In the rapidly changing scenario of building sector planners, architects, engineers and builders are searching for smart and energy efficient materials and technologies to adopt in future constructions that have benefits like energy efficiency, resources & water conservation, improved indoor air quality, life cycle cost reduction and durability. Therefore, to attain these objectives, application of the latest advancements in various technologies including developments in material science, use of environment friendly building materials, obtaining energy efficiency while producing such materials are of prime concern. SEMSI-2023 will provide an excellent opportunity for the speakers/delegates to discuss and share their views on the suggested themes. In addition to the contributed papers, the conference will also include keynote Lectures by experts.

OBJECTIVES OF THE CONFERENCE

The purpose of this conference is to bring together leading academicians, scientists, PG students and research scholars to exchange and share their experiences and research outcomes on all aspects of Smart Construction Materials and Technologies. It also provides an interdisciplinary platform to present and discuss the latest innovations, trends, concerns and adoption of suitable solutions for the various practical challenges encountered in the fields of Smart Construction Materials and Technologies.

Conference Themes

- Smart construction materials and techniques
- Super performing materials
- IoT in Construction
- Construction Automation
- Role of Artificial Intelligence in Construction sector
- Architectural advantages of innovative materials
- Ecological and energy efficient building materials
- Materials for thermal comfort
- 3D Printing in Construction
- Advanced testing techniques for building materials
- Long performance and self-healing materials
- Durability performance in harsh environments
- Composite Building materials
- Sustainable Binders and Concrete
- Nano-technology based cementitious material
- Service life and performance prediction models
- Sustainability and Life Cycle Assessment

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1. Dr. P. Venkateswara Rao, Professor/Civil Engineering, SVCE
2. Dr. M. Selvakumar, Associate Professor/Civil Engineering, SVCE
3. Dr. R. Sathia, Associate Professor/Civil Engineering, SVCE
4. Ms. Ruby Freya, Assistant Professor/Civil Engineering, SVCE

SCIENTIFIC & ADVISORY COMMITTEE

- **Dr. Mahendrakumar Madhavan,** Professor, Civil Engineering, IIT Hyderabad
- **Dr. S. Maheswaran**, Senior Principal Scientist, Advanced Materials Laboratory, SERC-CSIR, Chennai
- **Dr. Ajay Chourasia**, Senior Principal Scientist, Central Building Research Institute, Roorkee
- **Dr. R. Senthil**, Professor, Civil Engineering, Structural Engineering Division, Anna University, Chennai
- **Dr. E. S. M Suresh**, Professor of Civil Engineering, Head Dept. of Engineering Education, NITTTR, Chennai
- **Dr. K. P. Jaya**, Professor & Head, Civil Engineering, Structural Engineering Division, Anna University, Chennai
- **Dr. C. Umarani**, Professor & Director (CFR), Division of Structural Engineering, Anna University, Chennai
- **Dr. Madappa V. R. Sivasubramanian**, Associate Professor, Department of Civil Engineering, NIT, Puducherry
- **Ms. Hina Gupta**, Senior Scientist, Central Building Research Institute, Roorkee
- **Dr. J. Karthikeyan**, Associate Professor, Department of Civil Engineering, NIT, Trichirapalli
- **Dr. J. S. Sudarsan**, Program Director, School of Energy & Environment, NICMAR University, Pune
- **Dr. S. Nagan**, Professor, Civil Engineering, Thiagarajar College of Engineering, Madurai
- **Dr. R. Thenmozhi**, Professor & Head, Department of Civil Engineering, GCT, Coimbatore
- **Dr. V. Bhikshma**, Professor, Department of Civil Engineering, University College of Engineering, Osmania University, Hyderabad
- **Dr. T. Palanisamy**, Assistant Professor, Department of Civil Engineering, NITK, Surathkal
- **Mr. N. G. Muralidharan**, Chairman, Indian Concrete Institute (ICI) Chennai Centre

KEYNOTE SPEAKERS

Dr. S. Maheswaran
Senior Principal Scientist
Advanced Materials Laboratory
SERC-CSIR, Chennai

Topic Delivered: "Sustainable Materials for Construction: An Overview"

Dr. S. Maheswaran is specialised in the area of Materials Science and his areas of research include Development of generic mix design for Fly Ash, GGBS and calcined lime sludge based geopolymer concrete, Rheological properties of polymer based cementitious materials, Eco-friendly concrete by effective utilization of lime sludge, a paper and pulp industry waste product, Characterization Techniques such as XRD, Microscopy [SEM/TEM], Thermal Analysis [TGA/DTA], BET analysis & Spectroscopy [FTIR], Nanotechnology involving identification of potential nano-materials / nano-composites for engineering sustainable structures, Biomimetics based concrete. He has published a number of papers in Journals and conference Proceedings.

Dr. S. Maheswaran is the recipient of Best Paper award and medal from Indian Building Congress during 17th Annual convention for the paper titled 'Innovative Construction Materials for sustainable development based on Biomimetics', pp.1-7', presented during 16th Annual Convention of IBC, June 2010. He has prepared more than 25 technical reports for the in-house and externally funded Projects. He has completed a joint project titled "Development of textile reinforced polymer modified Cementitious mortar for retrofitting applications" with Institute of Chemistry and Technology of Polymers (now known as Institute of Polymers, Composites and Biomaterials, IPCB-CNR), Italy and visited Italy during 27th October to 31st October 2014 for the technical discussions and micro structural experimentation of the project. He has completed several inhouse projects and offered various consultancy and technical services to industries.

Dr. Mahendrakumar Madhavan

Professor
Department of Civil Engineering
IIT Hyderabad

Topic Delivered: "Cold Formed Steel Wall Panels for sustainable construction"

Prof. Mahendrakumar Madhavan is a Professor in the Department of Civil Engineering, Indian Institute of Technology (IIT) Hyderabad, India. He has obtained Ph.D. and MBA (Finance) from the University of Alabama at Birmingham and his Master's degree from the National University of Singapore. He is a Registered Professional Engineer (PE) in the State of Alabama USA. Prior to IIT Hyderabad, he worked as a Structural Engineer at Alabama Power Company, Birmingham, USA.

Prof. Madhavan is an international expert in Structural Steel, Cold-formed steel, and Steel-concrete Composite construction and has published more than 50 peer-reviewed internationally reputed journals. He currently holds membership in the "American Society of Civil Engineers (ASCE), Structural Engineering Institute (SEI), Technical Administrative Committee on Metals" and in "ASCE SEI Cold-Formed Steel Members Committee".

Prof. Madhavan has significantly contributed to the revision of IS 801: Indian Design Code for Cold-formed Steel Members based on the original research work carried out at IIT Hyderabad to fulfil the Government of India's goal of "Housing for All" through sustainable construction. He is an Editorial board member of the Journal of Structures and is an Associate Editor for the ASCE Journal of Structural Engineering and serves as a reviewer for more than ten international journals. Prof. Madhavan is a Fellow of the American Society of Civil Engineers (ASCE), Fellow of the Institution of Civil Engineers (ICE), London and is also the First Indian to be elected as a Fellow of ASCE's Structural Engineering Institute (SEI).

Dr. S. Praveenkumar

Assistant Professor (Sr,Grade)
Department of Civil Engineering
PSG College of Technology
Coimbatore

Topic Delivered: "Binders for durable and Sustainable concrete"

Dr. S. Praveenkumar obtained his B.E. Civil Engineering with Best outgoing student award from Sri Krishna college of Technology, M.E. Computer Methods and application in Structural Engineering from Coimbatore Institute of Technology, Coimbatore. He completed Ph.D. in civil engineering at Anna University, Chennai. He is recognized as supervisor for guiding Ph.D. scholars of Anna University under faculty of Civil Engineering in the areas of Concrete Technology, Materials Characterization and Structural Engineering. He is the life time member of professional bodies such as Institution of Engineers, Indian Society for Technical education, Indian Concrete Institute, International Association of Engineers, Indian Society for Construction Materials and Structures, International Association for Automation and Robotics in construction, Indian Association for Computational Mechanics, Indian Association for Structural Engineering. He has published more than 24 papers in Scopus indexed journals as well as Journals listed in annexure-1 of Anna University with high impact factor.

He received a grant of 2.75 lakhs from UGC, New Delhi under minor research project scheme for the period of 2017-2019 towards the project title "Synergic effect of agricultural wasters on mechanical properties of high-performance concrete". He also has received grants from various government agencies such as CSIR, UGC, MoEs etc for organizing workshop, seminar, FDP and training programme to worth of 5 lakhs. He is institutional in setting up a laboratory named "Advanced Concrete Research Laboratory (ACRL)" at PSG College of Technology, Coimbatore with advanced equipment's to study the behaviour of construction materials with respect to field applications. He has delivered more than 20 keynote lectures in FDP, Training programmes, workshop, seminar organised by various institutions in and around Tamil Nadu. He is reviewer in reputed journals of Elsevier, Sage and Springer publications. He is also a guest editor and editorial board member in reputed journals in field of civil engineering.

Dr. T. Palanisamy

Assistant Professor
Department of Civil Engineering
NITK, Surathkal

Topic Delivered: "Prediction of Strength of Building using Machine Learning Techniques"

Dr. T. Palanisamy is currently working as Assistant Professor in the Department of Civil Engineering at National Institute of Technology Karnataka (NITK), Surathkal, India. He has published 126 articles in journals and conference proceedings at National and International levels. He has delivered more than 186 keynote lectures in various levels, sponsored by AICTE, CSIR, DRDO and DST etc. He completed 4 funded projects from DST-SERB, DBT, AICTE etc., and at present 1 funded project is going on with worth of 0.38 core for the project titled "Development of concrete battery". He registered 14 patents along with co – inventors. He received 17 awards including the most esteemed award of "Viswakarma award – 2018" by Planning Commission of India, New Delhi, "Best Faculty Award – 2017", "Barath Rathana Mother Terasa Award - 2014, "Dr. A. P. J. Abdul Kalam Gold Medal Award – 2015". The Indian Concrete Institute honoured him by award of "Outstanding Young Concrete Engineer". Under his supervision, 11 students were completed Ph.D. thesis work. His area of research includes development of sustainable material for structural application and micro characterisation of the concrete.

Mr. Nagesh Puttaswamy

Former DGM Technical
Ultratech Cements Ltd.
Independent Civil Engineering Professional
Trainer, Mentor & Skill Enhancer

Topic Delivered: "Energy Efficient Sustainable Infrastructure Creation of Sustainable Bubbles – Necessity of Cross Functional Approach"

Mr. Nagesh Puttaswamy is currently working as independent Civil engineering professional, Trainer, Mentor, Skill upgrading & Quiz Master, catering for the requirement of Civil Engineering Profession, the Academic institution, and students to impart skills or upgrade skills, assistance in project work for students UG, PG or Doctoral work etc. He has about 36 years of experience in the field of civil engineering. He did his B.E. in Civil Engineering from the University of Mysore. From the year 1985 to 2006, he worked as a consultant, heading a sole Proprietary firm Nagesh Consultants, which met the requirements of various clients pertaining to Structural Designs of Buildings. From February 2006 to October 2022, he was working for M/s UltraTech Cement Limited. During which he had the experience of working in concrete mixes for challenging application and working with unique concrete construction, monolithic buildings, White Topping of bitumen road etc.

Mr. Nagesh Puttaswamy was also involved in various academic research work with M.Tech and Ph.D. works in the field of Concrete and Concrete base Construction Works. He was associated in several research works, experimental works in concrete construction with several agencies & organisations. He was also involved in implementation of Concrete Overlay on Bitumen Roads across the country. He has also directly involved in construction, quality management training of contractors, engineers, supervisors and also the grass root worker. Mr. Nagesh Puttaswamy was also involved and continuing to be involved in some academic research on pavement quality concrete. He was the Structural Consultant for St. Mary's Church, Navanagar, Bagalkot, which was awarded "ICI – Karnataka Hubli-Dharwar Centre UltraTech Outstanding Concrete Structure" for the year 2007-08. He was also awarded as "Outstanding Engineer for the contribution in Concrete Roads and Monolithic Building Technology" by the Institution of Engineers (India) Mysore Centre.

Dr. J. S. Sudarsan

Program Director
School of Energy & Environment
NICMAR University, Pune

Topic Delivered: "Sustainable Construction Techniques"

Dr. J. S. Sudarsan currently working as an Assistant Professor, Program director, Energy and Environment, NICMAR University, Pune. He completed his Ph.D. in Environmental Engineering at SRM University, Chennai. He did his Masters in Environmental Engineering, Annamalai University, Tamil Nadu. He also completed Post Graduate Diploma in Industrial Safety at Anna University, Coimbatore. He has worked as Assistant Professor at SRM University for about 12 years. He published in more than 100 papers in both scopus and web of science journals. He also presented Papers in both National and International conferences. He also reviewed many papers in journals such as MDPI, Bioresource Technology, Malaysian Journal of Nursing. Currently, he has more than 500 citations, H-index of 12, i10-index of 15.

Dr.J.S.Sudarsan published an Indian patent titled "Performance of Integrated Constructed Wetlands for treatment of Wastewater using native wetland spices". He received best teacher award in the year 2012 and 2013. He received National Eminent Researcher award 2022 from International Institute of Organised Research. He received the Best Research mentor award from American Chemical Society (ACS). He also received Senior Safety Professional Award 2022 for his contributions in the field of Health, safety, and environment. He also co-authored two books Titled "Concrete Technology" and "Repair and Rehabilitation of Structures" by ARS Publishers, Chennai. He also holds membership in many professional bodies such as Indian Water Works Association (IWWA), Institution of Engineering & Technology (MIET). U.K., Indian Society of Technical Education (ISTE), Indian Concrete Institute, etc.

LIST OF PAPERS

**Corresponding author*

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A COMPREHENSIVE OVERVIEW ON THE RECENT DEVELOPMENT ON LIGHTWEIGHT GEOPOLYMER FOAM CONCRETE

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[1]Department of Civil Engineering, Mepco Schlenk Engineering College, Tamil Nadu, India

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Abstract

In recent years, the development of sustainable materials as an alternative to cement concrete has received more attention. Geopolymer concrete is an emerging material which is found to be a better alternative for ordinary concrete. Addition of foaming agents in geopolymer can further decrease the thermal conductivity without compromising its mechanical properties. There will be a reduction in density, compressive strength, thermal conductivity and also an increase in porosity with foam addition. In this paper, a collective work on different foaming agents that are preferably used along with geopolymer mix was discussed in detail. Based on the foaming method, the mechanical and microstructure properties get varies. The foam-based concrete will show better performance in thermal resistance and low density when compared to lightweight aggregate concrete. Due to its low density, it will reduce the dead weight and improve the thermal insulation property of the building.

Keywords: Compressive strength, Foam, Geopolymer concrete, Lightweight, Thermal Resistance

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DESIGN AND FABRICATION OF ECO-FRIENDLY BRICK USING WASTE LOW-DENSITY POLYETHYLENE

M. Naveenkumar[1*], S. Abdul ravoof[1], S.V. Hemachandra[1], R.R. Abishek[1]

[1]Department of Civil Engineering, Easwari Engineering College, Chennai, Tamil Nadu, India.

Corresponding Author: er.naveenmanick@gmail.com

Abstract

The present study deals with the manufacturing and analysis of bricks using waste plastic Low-Density Polyethylene (LDPE) and Coir. LDPE bottles are cleaned and added with coir at 20% and 25% percentages to obtain high-strength bricks that possess thermal and sound insulation properties to control pollution and also reduce the overall cost of construction. The bricks are manufactured by heating waste plastic to a temperature range of 120℃ to 150℃ and mixing coir into the molten plastic. The bricks produced are lightweight, have a smooth surface and fine edges, do not have cracks, have low crushing strength, and have very low water absorption. The results showed that bricks made of plastic and coir gave a high compressive strength of 20Mpa at 20% of coir higher than bricks made of plastic and coir with a value of 21Mpa at 25% of coir also using solid works software analysed the strain test, stress test, displacement test and thermal test. The potential for using this technology and the materials it produces to transform LDPE plastic waste management in developing countries will be improved. The most important thing is to bring sustainable development for producing products before come to market.

Keywords: Plastic waste, Coir, Brick, Insulator, Solid works

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EXPERIMENTAL STUDY ON AUTOMATIC CLEANING ROADS USING WATER AND AIR

V. Santhana Lakshmi*[1], U. Jayashree*[2] and S. Poojidaa*[3]

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Abstract

The cleaning and maintenance of the pavement is the need of the town and urban communities now a day. Assuming individuals stand with the ongoing maintenance process, it will just extend and develop the crisis. Any numerous unsafe substances which influence human as well as climate and makes road frightful. It gives bad impact on the lower part of vehicles, for example, vehicles motors, and plastic wastage can be the reasons for major and minor accidents. The durability of the pavement is extensively relied upon the temperature variation. The change in temperature creates undesirable stresses in the pavement, which leads to the development of cracks. Eliminating and controlling of this kind of issues is the challenging task. The basic ideology of this paper is to achieve a smart road by cleaning the pavements by using water and air pressure and prevention of distresses in concrete pavements due to temperature variation. This paper also highlights the solution for potholes in concrete pavements.

Keywords: Nozzles, Pavement distress, Potholes, Road stud, Sensors for operation, Smart Road.

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EXPERIMENTAL STUDY ON 3R CONCRETE USING BUILDING AND INDUSTRIAL WASTE CONCRETE

A. Yogeshwaran*[1], R. Bhuvanesh Kumar[2], Jikku K Kurian[3]

[1,2,3] *Department of Civil Engineering, Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India*

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Abstract

The production of conventional concrete requires coarse aggregate, fine aggregate, cement, and water. This conventional concrete though has required strength it proves to be expensive as well as environmental unfriendly. Thus, there is the need for research on partial replacement of the conventional constituents of concrete. This study focused on reducing the overall construction cost of concrete by partial replacement of fine aggregate and coarse aggregate using building waste such as brick powder, concrete waste and marble and industrial waste steel waste. An experimental study was made on utilization of these materials and understanding its impact on the characteristics of concrete with respect to both fresh and hardened properties of concrete such as compressive strength and workability. In this experimental investigation, three different samples were prepared: Conventional concrete, Concrete with 10% partial replacement of fine aggregate and coarse aggregate with building and industrial waste and concrete with 15% partial replacement of fine aggregate and coarse aggregate with building and industrial waste. From this experiment it was discovered that the maximum compressive strength was obtained when the concrete was replaced with fine aggregate and coarse aggregate during 15% partial replacement using industrial and building waste. The workability achieved is medium workability which can be used for flat slabs with normal and heavy reinforcements.

Keywords: Brick powder, Coarse aggregate, Concrete waste, Fine aggregate, Industrial steel waste, Marble

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EXPERIMENTAL INVESTIGATION ON CRUMB RUBBER-BASED CONCRETE BRICKS ALONG WITH POLYPROPLYENE FIBRE

Vignesh A*[1], Gopinath A V[2], Yokesh J P[3], Vijay Vignesh A[4]

[1, 2, 3,4]*Department of Civil Engineering, Sri Venkateswara College of Engineering, Sriperumbudur, Tamil Nadu, India*

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Abstract

Recently in India, there is an exponential growth in the automobile sector leading to increasing demand for tires which further results in huge tire waste after their service life. Considering the utilization of this utilization construction industry, the investigation mainly focused on the use of waste crumb rubber as a partial replacement of fine aggregates in the production of lightweight masonry bricks. Also, to support a sustainable environment, an attempt has been made to utilize tire waste in the form of crumb rubber for the production of rubber-based concrete bricks. In this study, we proposed to use waste crumb rubber tires in partial replacement of fine aggregates for developing bricks. This study proposes the development rubber based concrete bricks made up of material, crumb rubber (CR) as fine aggregate, Polypropylene fibers (PF).

Keywords: Environmental and Sustainability, CR-Crumb Rubber, CRC-Crumb Rubber Concrete

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IMPLEMENTATION OF BASE-ISOLATION TECHNIQUE IN THE DESIGN OF MEGA HOSPITAL BUILDING

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Corresponding Author: sivasubramanian.p1@lntecc.com

Abstract

Base isolation system is to separate building sub structure from the super structure by device called Seismic Base Isolator to reduce the destructive effect of earthquake on building. This system reduces the natural frequency of the building vibration by increasing time period the structure during earthquake and helps to increase energy dissipation in the structure. Hospital provides vital services to the community, especially during or after natural natural disaster such as an earthquake, in order to reduce the risk to human life and protect infrastructure, it must be physically and functionally safer than other buildings. In this paper the analysis and the design of Base isolated hospital building located at high seismic vulnerability zone in India is studied. Time History raw data gathered, scaled and NLTHA performed in the hospital (B+G+10) building for maximum considered earthquake (MCE) condition as per ASCE 7-16 and the performance of the building such as drift, displacement and the axial capacity of the isolator are bound within the limit of codal recommendation.

Keywords: Base Isolation, LRB (Lead-Rubber Bearing), NLTHA, Maximum Considered Earthquake (MCE)

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EXPERIMENTAL STUDY ON PARTIAL REPLACEMENT OF FINE AGGREGATE USING BOTTOM-ASH IN CONCRETE

Eshanthini P [1]*, K Srishanth[2], K. Sarayu[3]

[1,2,3]*Department of Civil Engineering, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India*

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Abstract

The consumption of concrete is increased worldwide. The commonly used cementitious material the concrete are cement and fly ash. The usage of cement is decreased because of high energy consumption, emission of greenhouse gasses during production and the supply of fly ash is also reduced due to the closure of coal –fired power plants. This study aims to examine partial replacement of cement using bottom-ash. Bottom ash is the waste material from coal power plants. This waste material contains many particles like SiO_2, FeO_3, Al_2O_3, CaO, TiO_2 etc. Which can be used in construction to enhance the performance of concrete in building. By leaving these elements in ground can be hazardous to our environment. The bottom –ash was collected from Neyveli Lignite Corporation, Neyveli, Tamil Nadu. The experimental investigation was carried out for replacing cement with 20 % and 25 % of bottom ash by weight. Test on concrete was conducted for 7,14 and 28 days. The results shows that Mechanical properties, Compressive strength and modulus of rupture and durability properties like water absorption; Test results indicated that concrete span, concrete strength etc have been increased significantly. However, no significant effect on mechanical properties was observed. Furthermore, the additions of wastes have increase concrete properties and it is used to reduce pollution and dust resistant too. Therefore, it can be concluded that cost of cement can be minimized and environmental burden leading towards more economical and stable construction. By this we can reduce the space acquired by unused bottom-ash. By using copper wire, we can reduce e-waste which was one of the land pollution, and that can be reduced.

Keywords: Fly ash, Cement, Bottom ash, Pollution

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DYNAMIC STUDY ON 3D-RC FRAMED BUILDING

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Abstract

The world has been reminded of the terrible potential of natural catastrophes by the destruction wreaked by them the last year 2022. Large economic losses have been caused by natural disasters like earthquakes. Nearly half of the Indian subcontinent is at risk of earthquakes. Recent earthquakes in India have brought into sharp focus the need for earthquake engineering. Even if these risks cannot be eliminated entirely, they can be lessened with well-designed structures. The purpose of IS 1893:2016 is to prevent harm to people and the collapse of structures. This requires buildings to be built in a way that can react to the anticipated ground movements caused by earthquakes. Dynamic load has an effect, but it is generally disregarded because of the extra effort and time it takes to solve. Therefore, most buildings in Civil Engineering are built with the assumption that the loads acting upon them are static. Dynamic forces, such as earthquakes, are particularly dangerous if they are ignored. Recent seismic activity has brought into sharp focus the value of dynamic analysis. Therefore, there has been a rise in demand for Civil Engineering projects that can withstand dynamic loads, such as those caused by earthquakes. The height of a building is related to its fundamental period of vibration, which may be determined using simple empirical formulas provided by many design guides. For force-based design, it has been discovered that these equations are helpful in predicting lateral shear force from an acceleration spectrum. In order to assess the extent of any possible damage to the structure, the displacement demand is measured. Using the empirical formulae from IS 1893(Part 1) and the finite element modelling software SeismoStruct, we examine the fundamental periods of a 3-D RC framed building. In this article, we examine the data and investigate the factors that determine a building's fundamental period of 3-D RC framed building.

Keywords: Earthquake, dynamic load, fundamental frequency, 3-D RC frame, SeismoStruct, fundamental period

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STUDY OF FOAM CONCRETE USING RICE HUSK ASH AS A GREEN REPLACEMENT OF SAND

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Abstract

Concrete is a highly versatile construction material. It is naturally heavy in weight and has high compressive strength. However, conventional concrete's application is limited mostly to mass constructions thereby restricting its widespread usage in special application areas. Foam Concrete has the potential of being an alternative to conventional concrete, as it reduces the dead load on the structures and lowers the cost of production, construction, and transportation. Foam Concrete is commonly prepared using cement, sand, water and foaming agent. Because of its porous matrix, it also serves as a low cost, highly effective solution for thermal and acoustical needs of the building. In addition, its lightweight and self-compacting properties makes it even easier for use in special construction. This study is undertaken to assess the properties of Foam concrete using Rice husk ash in 50% and 100% replacement to sand. A short duration study (at 7 and 28 days of curing) is conducted by casting cubical concrete specimens of size 7cm×7cm×7cm in order to analyse and compare the properties between conventional Plain cement mortar, conventional foam concrete, 50% and 100% replacement of sand with rice husk ash. The foaming agent used to prepare foam concrete is Sodium Lauryl Ether Sulphate (SLES) – a surfactant commonly used in personal care products. This study was aimed to utilize rice husk ash as an eco-friendly replacement for sand in making foam concrete. A Comparative study of properties namely Compressive Strength, water absorption and dry density were done to assess the effectiveness in replacing sand with rice husk ash and its suitability in making foam concrete. The results of these tests were found to be satisfactory and the use of rice husk ash as replacement of sand in foam concrete is recommended.

Keywords: Foam Concrete, Sand, Rice husk ash, Foaming agent

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STUDY THE INTERACTION BEHAVIOUR OF INTEGRATED INFILLED FRAMES WITH INTERFACE MATERIALS

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Abstract

High rise or multi-story buildings are more prevalent in urban regions because of industrialization and population concentration. Using masonry or concrete brickwork as infills, infilled frames are made of steel or reinforced concrete columns and girders. Multistorey concrete buildings always have infill masonry walls in framed constructions, notably for use in sealing functions. Partition walls typically come with frames for practical reasons. Because they absorb and disperse greater seismic forces, although stiffer frame attracts large seismic loads, presence of infills has greatly involved the collapse of buildings due to severe ground shaking produced by earthquakes. In earthquake-prone areas, infill walls have an impact on the ductility, stiffness, and strength of framed structures. In regions with greater seismic zones, infill frames perform better. Because of the composite action between the frame and the infill, infill frames are more resistant. In this paper, the study is carried out on single bay, single-storeyed Reinforced Cement Concrete square frame model with masonry infilling. In the model the loading is applied through diagonal of the frame in which the behaviours resemble the prototype of RC structure subjected to lateral loading. In this infilled frame brick masonry is used as infill materials and different interface materials are used (cement mortar, foam rubber, cork ,bitumen ,recycled plastic). And applying the cyclic loading on the frame.

Keywords: Infill frames, Interface materials, Brick masonry, Cement mortar, Foam rubber Cork, Bitumen, Recycled plastic and Cyclic loading.

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STUDY ON FLEXURAL BEHAVIOUR OF REINFORCED CONCRETE WITH POLYPROPYLENE AND CRIMPED STEEL FIBERS

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Abstract

The process of construction evolves day by day with new techniques and materials. Since the materials used in the construction process are non-renewable, we are in need of new materials and methods in order to make the construction process sustainable. In this research work we are going to use such materials to make the reinforced concrete a better material in for the construction. The materials which we are using in the concrete should enhance the flexural and shear strength of the concrete. In this study, crimped steel and polypropylene fibres are used to improve flexural and shear performance of reinforced concrete. The purpose of this work is to present the results of a study carried out to characterize the structural behavior of FRC beams under shear loading, considering fibres of different materials (steel and polymeric). Further, the study aims to evaluate the ability of predicting the ultimate shear capacity of concrete beams. At the same time, it is verified whether the design methods for SFRC can be extrapolated to polypropylene fibre reinforced concrete (PFRC). This study is also aims to improve the strength of reinforced concrete by providing zig-zag stirrups. The concrete mix design was arrived and four different types of concrete specimens was prepared namely conventional concrete (0% fibres), Crimpled Steel fibres + polypropylene fibres (CSF+PF) (0.4% + 0.4%), Crimpled Steel fibres + polypropylene fibres (CSF+PF) (0.8% + 0.8%), Crimpled Steel fibres + polypropylene fibres (CSF+PF) (1.2% + 1.2%). The specimens are subjected to curing and testing after 28 days. It has been found that the compressive strength, split tensile strength and flexural strength of the CSF+PF (1.2% +1.2%) specimen performs better when compared to the all-other specimens. In addition to the concrete specimens the beam element also casted with the above mention percentage of CSF and PF. The beam element is subjected to the two-point loading test and the results were discussed.

Keywords: crimpled Steel fibre, flexure test, polypropylene, SFRC beam, two-point loading test, zig-zag stirrups.

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TREATMENT OF DAIRY WASTEWATER BY SEED, PEEL AND MUCILAGE BASED NATURAL COAGULANTS

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Abstract

The dairy industry is one of the leading food processing industries in the world. The wastewater discharge from dairy industry contains high Chemical Oxygen Demand, Biochemical Oxygen Demand, nutrients, and organic and inorganic contents. The present study focuses to treat dairy wastewater with natural coagulants (based on seed, peel and mucilage) and then tests are carried out to calculate the variation of pH, Turbidity, BOD and COD in the treated wastewater. Natural coagulants used are Moringa oleifera, Abelmoschus esculentus, Musa paradisiaca, Trigonella foenum, Aloe barbadensis Miller and Citrus limetta. The initial pH, turbidity, BOD and COD are 6.64, 0.12 NTU, 50 mg/L and 450mg/L respectively at 33°C. By varying the coagulant dosage Optimum Coagulant Dosage were found for Citrus limenta at 20mL, for Abelmoschus esculentus at 15ml, for Musa paradisiaca at 25ml, for Trigonella foenum at 20 mL, for Moringa oleifera at 20mL and for Aloe barbadensis Miller at 25mL. Turbidity, BOD and COD level were efficiently reduced while using natural coagulants. Results indicate that when compared to other coagulants Abelmoschus esculentus and Citrus limetta were efficient in the treatment of dairy wastewater. Musa paradisiaca and Trigonella foenum were not as efficient as compared to other plant based natural coagulants.

Keywords: Diary Wastewater, Seed, Peel, Mucilage, Natural coagulants

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ANALYSIS OF GROUND WATER - TAMBARAM MUNICIPALITY

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Abstract

Groundwater is an essential natural resource for securing drinking water and plays a significant role in human well-being. However, in recent times the pressure on groundwater has increased both quantitatively and qualitatively. The sources are threatened by contamination through human exploitation. The objective of this study is to assess the water quality parameters in the Tambaram Municipality. In the present study, 20 water-quality sample were collected using systematic random sampling methods and the physio-chemical parameters such as pH, EC, TDS, TH, TA, Ca, Mg, NO_3, F and Fe were analysed to determine whether the water is healthy to use for the purpose of drinking. The study area has been experiencing rapid industrialization and urbanization. As the area lacks surface water this has made the people depend more on groundwater resources. The suitability of water for drinking purposes in the study area is calculated using WQI. This is calculated by using standards of drinking water quality recommended by the Bureau of Indian Standards 10500:1993 (BIS). It was observed from the WQI map that around 80% of the total area is excellent fit for drinking and the remaining falls under the range of good quality drinking water.

Keywords: Ground Water, contamination, Water Quality Index

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SEISMIC ANALYSIS OF EARTHQUAKE RESISTANT BUILDING USING ETABS

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Abstract

This project focuses on analysis and designing an earthquake resistant building on ETABS software by using base isolation system. An earthquake occurs in the form of seismic waves due to sudden release of energy and results in ground shaking. During earthquake, seismic waves propagate through the soil which results in structural damage due to movements within the earth's crust. It impacts the behaviour of interaction of components like building, foundation, underlying soils and also overall system behaviour. When earthquake occurs, the behaviour of a building depends on distribution of mass, strength and stiffness.

Keywords: Earthquake resistant building, ETABS, Strength, Stiffness

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MODELING OF SPATIALLY DISTRIBUTED SURFACE RUNOFF GENERATION USING ARCGIS - A CASE STUDY IN CUDDALORE DISTRICT

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Abstract

Flood is a natural disaster which causes serious damage on the earth surface; it is a relatively high flow of water that overtops the natural and artificial banks in any of the reaches of a stream. The severity of flood may vary from region to region and the destruction caused due to same varies accordingly. Cuddalore district being a coastal zone is mostly covered by plain terrain regions. This research aims to determine the runoff depth using the soil conservation service curve number (SCS-CN) method with geographic information technique (GIS) using ArcGIS. Land use Land cover map, Hydrological soil group map, CN curve number map were created using ArcGIS. The curve number method was used to estimate the runoff depth for selected storm events in the watershed. The rainfall and temperature data for daily was obtained from the meteorological department for the years. The work is carried out by morphometric analysis in river basins in Cuddalore district to find the of vulnerability area. By using satellite images (SRTMDEM) base map such as slope, contour, stream, and watershed, were created using ARCGIS software. This vulnerability assessment map will be useful for managing and mitigating the socio-economic losses from recurrent flood disaster in Cuddalore district.

Keywords: Flood, Runoff depth, Disaster, Geographic Information technique (GIS)

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FILTERED SAND - AN ALTERNATE FOR RIVER SAND AND M-SAND

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Abstract

The tremendous growth in urbanization and industrialization leads to depletion of natural resources. In a developing country like India, there are problems related to environmental imbalance and CO_2 emissions. There is increasing difficulty in obtaining good quality natural river sand which is used as fine aggregate in concrete. It is expected that demand of raw materials for concrete will double in the next two to three decades given the present rate of consumption. Over the past few years, researchers have studied natural crushed rock sand, copper slag, waste foundry sand, coal ash, recycled sand etc, which can also be used in concrete as fine aggregate. Scarcity of natural sand is the biggest concern for the construction industry in India and the local authorities imposing ban on the dredging of river sand further aggravates the problem. It is forecast that the naturally available sand will not be able to meet the required demand. One solution to this problem can be alternative sourcing of manufactured sand. This paper gives an idea of utilizing filtered sand as an alternative for river sand and m-sand in the manufacture of concrete.

Keywords: River sand, M-Sand, Filtered sand, Construction Industry.

YOUTUBE LINKS

S.No	Name of the Speaker	Title of the Lecture	Link
1.	**Dr. S. Maheswaran** Senior Principal Scientist Advanced Materials Laboratory SERC-CSIR, Chennai	Sustainable Materials for Construction: An Overview	https://youtu.be/0RaE-KF0dBo https://www.youtube.com/watch?v=-xixgtdGj08 https://www.youtube.com/watch?v=Sgkrbv49ou4
2.	**Dr.Mahendrakumar Madhavan** Professor Department of Civil Engineering IIT Hyderabad	Cold Formed Steel Wall Panels for sustainable construction	https://youtu.be/PpsESf6VUsA https://youtu.be/a1VCpxklfxQ https://youtu.be/2iYAHFdVpZs https://youtu.be/7Vfzmwb5pko
3.	**Dr. S. Praveenkumar** Assistant Professor (Sr Grade) Department of Civil Engineering PSG College of Technology Coimbatore	Binders for durable and Sustainable concrete	https://youtu.be/-GYU7N9Riuc https://youtu.be/oPhgsmVHz3o https://youtu.be/S63NDerkm10
4.	**Dr. T. Palanisamy** Assistant Professor Department of Civil Engineering, NITK, Surathkal	Prediction of Strength of Building using Machine Learning Techniques	https://youtu.be/DA--Wt3gvK0 https://youtu.be/kJrYQZmJzoc https://youtu.be/Buytb7KhAKg https://youtu.be/psHuGmFNt7Y
5.	**Mr. Nagesh Puttaswamy** Former DGM Technical Ultratech Cements Ltd. Independent Civil Engineering Professional Trainer, Mentor & Skill Enhancer	Energy Efficient Sustainable Infrastructure Creation of Sustainable Bubbles – Necessity of Cross Functional Approach	https://youtu.be/u2axqvbiD0U https://youtu.be/Op7G_YO2fzk https://youtu.be/5m59rJHW27I https://youtu.be/OlPlB46T3ig
6.	**Dr. J. S. Sudarsan** Program Director School of Energy & Environment NICMAR University, Pune	Sustainable Construction Techniques	https://youtu.be/fhXhjBbxBcI https://youtu.be/6Uf0bIYDjRI https://youtu.be/9NyWBox52I4

Sri Venkateswara College of Engineering

Department of Civil Engineering

Vision of the Department

To become a department of excellence in Civil Engineering education and research producing globally competent civil engineers to serve the industry and society.

Mission of the Department

The department vision will be achieved by

- Providing state-of-the art resources that contribute to an excellent learning environment.
- Imparting necessary skills, cultivating moral and ethical values.
- Establishing regular interaction and collaboration with industries.
- Motivating the students to take up competitive exams and pursue higher education.
- Promoting research and development activities in emerging areas of civil engineering and offering services to society and industry through education, research and consultancy activities.

Program Educational Objectives

Civil Engineering graduates during the first few years of graduation will:

1. Practice civil engineering in construction industry, public sector undertaking or as an entrepreneur by applying ethical principles and following norms of civil engineering practice
2. Pursue higher education for professional development
3. Exhibit leadership and team working skills in their profession and other activities with demonstrable attributes to contribute to the societal needs and to adapt to the changing global scenario.

Program Outcomes

Students in the Civil Engineering program should, at the time of their graduation, be able to

1. Apply the knowledge of mathematics, science, engineering fundamentals and concepts of Civil Engineering to the solution of complex engineering problems. **(Engineering knowledge)**
2. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics,

natural sciences and engineering sciences. **(Problem analysis)**

3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. (**Design/Development of Solutions)**
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems. (**Conduct Investigations of Complex Problems)**
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. (**Modern Tool Usage)**
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. (**The Engineer and Society)**
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. (**Environment and Sustainability)**
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. **(Ethics)**
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. **(Individual and Team Work)**
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. (**Communication)**
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. (**Project Management and Finance)**
12. Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change. (**Life-long Learning)**

Program Specific Objectives

Students in the Civil Engineering program should, at the time of their graduation, be able to

1. Provide solutions for real life problems related to core areas of civil engineering by applying knowledge of mathematics, Basic and Engineering Sciences and by using appropriate engineering tools.
2. Plan, analyse, design, execute and manage infrastructure projects considering safety, societal and environmental factors.

DEPARTMENT OF CIVIL ENGINEERING

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To become a department of excellence in Civil Engineering education and research producing globally competent civil engineers to serve the industry and society.

DEPARTMENT MISSION

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- **Imparting necessary skills, cultivating moral and ethical values.**
- **Establishing regular interaction and collaboration with industries.**
- **Motivating the students to take up competitive exams and pursue higher education.**
- **Promoting research and development activities in emerging areas of civil engineering and offering services to society and industry through education, research and consultancy activities.**

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