1.3.3: Number of course that include experiential learning through project work/field work/internship during last year

Dept: B.E. Civil Engineering **Academic Year-2023-2024**

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PRINCIPAL
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ANALYSIS AND DESIGN OF A G+2 RESIDENTIAL BUILDING USING STAAD Pro

A PROJECT REPORT

Submitted by

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ASIF K

KUTHRATH NIYAS M

SAIFULLAH N

in partial fulfillment for the award of the degree

of

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in

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ANNA UNIVERSITY :: CHENNAI–600025

NOVEMBER 2023

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BONAFIDE CERTIFICATE

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INTERNAL EXAMINER

EXTERNAL EXAMINER

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ABSTRACT

This project focuses on the design of a G+2 residential building constructed with reinforced concrete, covering a total area of 400 square meters. The building comprises slabs, beams, columns, and footings. To ensure its structural integrity, appropriate loads are applied after performing load calculations in accordance with the Indian Standard code.

The project employs STAAD Pro software, where the dimensions and loading parameters are input for detailed structural analysis. The results of this analysis closely align with manual calculations, demonstrating a high degree of similarity in the design outcomes. The architectural plans for the building are crafted using AutoCAD and further refined through analysis and design using STAAD Pro.

In accordance with the Indian Standard code, the design of this G+2 residential building considers factors such as dead loads, live loads, and wind loads, as well as various load combinations. It fully complies with the requirements outlined in IS 456:2000, utilizing the Limit State Method for the design process. The manual analysis follows the moment distribution method, while the manual design process adheres to the limit state method. Furthermore, these calculations meet the stipulations of IS 875: Part 1 to 5, SP 16, and SP7 (NBC), including considerations for features such as parking lot areas.

CHAPTER 9

CONCLUSION

As indicated in the abstract, we have undertaken a thorough and meticulous endeavor to design and detail a G+2 residential building. The framed structure of this building is analyzed and designed using STAAD Pro. This comprehensive process includes the creation of shear force and bending moment diagrams for the structure.

Every structural member is meticulously designed in accordance with the limit state method, and Indian standard codes are applied to determine loadings and load combinations. The detailed drawings of each structural element are crafted using AutoCAD. The results obtained from the structural analysis in STAAD Pro are thoughtfully compared with manually derived outcomes.

Our project work is thoughtfully structured to encompass all major aspects of design. Over the course of this project, we have acquired significant knowledge in the analysis and design of slabs, beams, columns, staircases, and ramps. Furthermore, we have addressed the design of foundations and staircase. The manual design of the structure adheres to the standards set by IS 456: 2000. In addition, we have gained valuable experience in the practical applications of AutoCAD during the project's execution.

ANALYSIS AND DESIGN OF RESIDENTIAL BUILDING USING STAAD PRO

A PROJECT REPORT

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ABSTRACT

The principle objective of this project is the comparative study on design and analysis of G+2 "Residential building" by using STAAD Pro software. STAAD Pro. is one of the leading software's for the design of structures. In this project we have analysed the G+2 Residential building for finding the shear forces, bending moments, deflections & reinforcement details for the structural components of building(such as Beams, columns and slabs) to develop the economic design. Finally we will make an attempt to define the economical section of residential building using STAAD Pro. Software .

The structure is designed satisfying the load requirements of **IS 456: 2000** (Limit State Method). These design aid is used to simply the design process and also **IS 875: Part 1 to 5, SP 16 , SP 34** is used for detailing.

CHAPTER 7

CONCLUSION

i. From the work carried out in STAAD pro we can conclude that Using STAAD.Pro the analysis of Residential building has completed much quicker when compare with manual analysis.

ii. It is observed that the reinforcement percentage in the sections is more in the case of software design when compared to manual calculations.

iii. Designing using Software's like STAAD reduces lot of time in design work.

iv. Reinforcement Details of each and every member can be obtained using STAAD pro. All the List of failed frame sections can be obtained in the report given by STAAD Pro so that we can change the property data for a better section.

v. Shear variation and moment variation of particular section can be observed clearly on the building.

vi. Accuracy is improved by using software.

vii. Reinforcement details of each member can obtain directly after analyzing the building.

ANALYSIS AND DESIGN OF A RESTAURANT BUILDING USING STAAD Pro

A PROJECT REPORT

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ABSTRACT

This project aims to apply theoretical knowledge acquired during the course of study to the design of a restaurant building. The focus is on the reinforced concrete frame structure, with a floor area of 195 m^2 (or 2100 sq feet) and a total area of 215 m^2 (or 2300 sq feet), comprising beams and columns. The frame is loaded with appropriate loads specified in IS 875 (PART-1) for Dead load and IS 875 (PART-2) for Live load. Manual calculations for beam, column, slab, and footing are performed. In the event of structural failure during analysis, adjustments are made to the structure's geometry. Subsequent load applications and analyses are conducted until a satisfactory structural performance is achieved. If the structure remains stable, detailed designs for beams and columns are generated using STAAD Pro.

The building plan is created using AutoCAD, and the structural design is finalized with STAAD Pro. The entire design process, considering dead load, live load, and load combinations, adheres to the guidelines provided by the relevant IS codes.

CHAPTER 8

CONCLUSION

The structural analysis, conducted using STAAD Pro, confirms the safety and reliability of the structure, leading to the successful derivation of design details for the restaurant building. AutoCAD is employed for drafting purposes. The structure exhibits shear force, bending moment, and deflection within permissible limits, ensuring its capability to withstand heavy loads without sustaining damage.

This project has provided valuable insights into structural designs, drawings, and material resourcing. The combination of theoretical understanding and practical application gained from this project contributes significantly to our knowledge base for future endeavors. Specifically, it has enhanced our proficiency in AutoCAD drafting and STAAD Pro analysis.

In summary, the utilization of advanced tools and methodologies in this project not only ensures the structural integrity of the restaurant building but also equips us with essential skills and knowledge that are instrumental for our future undertakings.

ANALYSIS AND DESIGN OF HOTEL BUILDING IN SEISMIC ZONE

A PROJECT REPORT

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INTERNAL EXAMINER

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ABSTRACT

The objective of this project work is to apply the concept of theoretical knowledge obtained during the course of study to design the Hotel building. The project deals with the design of G+3 storied reinforced concrete frame structure of a commercial building is 180m^2 and total area is 250m^2. The frame consists of beams and columns. Then the frame is loaded with suitable load after load calculation are done as per Indian Standard code. The dimensions and loading are given as input data in STAAD Pro and the building is analysed. The analysis is compared with the manual calculation as the design match with almost similarity. The plan of the building drawn in the AutoCAD, analysed and designed using STADD Pro. Hence, the design of G+3 Hotel building for dead load, live load, the load combination is done by using IS-code It is designed satisfying the requirements of IS 456: 2000 (Limit State Method). Method used for manual analysis is moment distribution method and method used for designing manually is limit state method. These calculations also fulfil the requirements of IS 875: Part 1 to 5, SP 16 and SP7 like area of parking lot.

CHAPTER 7

CONCLUSION

As stated in the abstract, a comprehensive work on the design & detailing of the HOTEL BUILDING subjected to seismic loading with more care and sincerity has been carried out.

In this project we have tried to design a Multi-storeyed hotel building with seismic loads as framed structure. The framed structure for the building is analysed using STADD Pro software and modelling through Auto CAD. The shear force and bending moment diagram of the structure is arrived. All the members are designed by limit state method. Indian standard codes are used for the loadings and load combinations. Detailing of each structural member was done using Auto CAD. The structure analysed in STAAD Pro is compared with manually determined results.

The code book IS 456:2000, IS 1893(Part 1), 2002 & IS 875:1987(Part 1&2) has been referred for loading and seismic loads. To achieve uniform horizontal deflection of the framed structure due to application of lateral loads, the diaphragm action has been incorporated using master slave command. While the project work, we have gained knowledge about analysis and design of two-way slabs and singly, doubly reinforced beams and uniaxially, biaxially loaded columns, staircase and ramps.

The design of structure is done manually as per standards of IS 456:2000, in addition we have learnt the applications of AUTO CAD & STAAD while this project.

ANALYSIS AND DESIGN OF A HOSPITAL BUILDING USING STAAD PRO

A PROJECT REPORT

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EXTERNAL EXAMINER

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ABSTRACT

The objective of this project is to apply the theoretical knowledge acquired during the course of our studies to the design of a hospital building. The project involves designing a hospital building with a reinforced concrete frame structure spanning two floors (G+2). The total area of the building is 600 square meters. with the hospital portion covering 140 square meters. This frame structure is composed of beams and columns.

The building's architectural plans are created using AutoCAD, and the structural analysis and design are performed using STAAD Pro. To ensure the structural integrity of the building, loading calculations were done in accordance with the Indian Standard codes. The structure is analysed using STAAD Pro software. Manual design calculations are performed and the results are compared with the STAAD Pro analysis. It is found that the results closely match with each other.

Consequently, the design of this G+2 hospital building accounts for dead loads, live loads, and various other load combinations in accordance with the IS code.

The design adheres to the requirements of IS 456:2000, utilizing the Limit State Method. All calculations are performed to utilizing the standards outlined in IS 875: Part 1 to 5, SP 16, and SP 7, including considerations for a parking lot area.

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CHAPTER 7
CONCLUSION

As stated in the starting pages of project report (abstract), a comprehensive work on the design & detailing of the HOSPITAL BUILDING with more care and sincerity.

In this project we have made an attempt to design a Hospital building as framed structure. The framed structure for the building is analysed using STADD Pro software and design through Auto CAD. The shear force and bending moment diagram of the structure is done. All the members are designedby limit state method. Indian standard codes are used for the loadings and load combinations. Detailing of each structural member was done using Auto CAD. The structure analysed in STAAD Pro is compared with manually determined results. We do that each & every chapter of this project will be immense we to student's community in the study of slab, beam and column.

The project work is done in such a manner so as to cover all major work of design. During the course of the project work we have gained much knowledge about analysis & design of slab, beam, column, staircase, foundationhas to be designed.

The design of structure is done manually as per standards of IS 456:2000,in addition we have learnt the applications of AUTO CAD during the course of this project.

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ANALYSIS AND DESIGN OF INSTITUTIONAL BUILDING USING ETABS

A PROJECT REPORT

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ABSTRACT

This project deals the design of G+8 stored Reinforced Concrete Institutional building of total area is 1353 Sq.m. Building consists of Slab, Beam, Column and Footing. Then the structure is loaded with the suitable loads after load calculation are done as per Indian Standard code. The dimensions and loading are given as input data in **ETABS** and the building is analyzed. The analysis is compared with the manual calculation as the design match with almost similarity. The plan of the building drawn in the AutoCAD, analyzed and designed using ETABS

Hence, the design of G+8 Institutional building for dead load, live load, wind load, the load combination is done by using IS-code.

It is designed satisfying the requirements of **IS 456: 2000** (Limit State Method). Method used for manual analysis is moment distribution method and method used for designing manually is limit state method. These calculations also fulfill the requirements of **IS 875: Part 1 to 5, SP 16 and SP7 (NBC)** like area of parking lot.

PRINCIPAL
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15. CONCLUSION:

- In conclusion, our project on the design and detailing of an RCC building using ETABS has been a tremendous learning experience for our team of college students.
- Through rigorous analysis, calculations, and attention to detail, we successfully created a structurally sound and aesthetically pleasing building that adheres to modern construction standards.
- Leveraging the power of ETABS has notonly improved our understanding of structural engineering but also allowed us to optimize our design for efficiency and safety.
- This project has emphasized the importance of collaboration and communication among team members as we faced various challenges and made informed decision.
- Moving forward, we aim to stay updated with evolving technologies and methodologies in the field, always striving for innovation and sustainability
- Overall, this project has showcased our dedication to excellence in structural engineering

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ANALYSIS AND DESIGN OF SMART RESIDENTIAL BUILDING USING STAADPRO

A PROJECT REPORT

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NTERNAL EXAMINER

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ABSTRACT

This project deals the design of G+1 stored Reinforced Concrete Smart Residential building of 1467 sq ft and total area is 1997 sq ft Building consists of Slab, Beam, Column, Footing and implementation of solar panels at terrace which gives an effective and easy way to introduce clean energy with proven technology. Following project fulfill requirement of clean and renewable energy in our building and hen the structure is loaded with the suitable loads after load calculation are done as per Indian Standard code. The dimensions and loading are given as input data in **STAAD Pro** and the building is analyzed. The analysis is compared with the manual calculation as the design match with almost similarity. The plan of the building drawn in the AutoCAD, analyzed and designed using STADD Pro. Hence, the design of G+1 Residential building for dead load, live load, wind load, the load combination is done by using IS-code. It is designed satisfying the requirements of **IS 456: 2000** (Limit State Method). Method used for manual analysis is moment distribution method and method used for designing manually is limit state method. These calculations also fulfill the requirements of **IS 875: Part 1 to 5, SP 16 and SP7 (NBC)** like area of parking lot.

CHAPTER 8

CONCLUSION

In this project we have made an attempt to design a residential building as framed structure. The framed structure for the building is analysed using STADD Pro software and design through Auto CAD. The shear force and bending moment diagram of the structure is done. All the members are designed by limit state method. Indian standard codes are used for the loadings and load combinations. Detailing of each structural member was done using Auto CAD. The structure analysed in STAAD Pro is compared with manually determined results.

The project work is done in such a manner so as to cover all major work of design. During the course of the project work we have gained much knowledge about analysis & design of slab, beam, column and staircase.

We have acquired an idea of structural designs, structural drawings and the source of materials. This project provides us a good theoretical and practical knowledge, which will be useful for our future. This project was very much helpful for us to obtain more knowledge about drafting using AutoCAD and analyzing-using-STAADPro..

ANALYSIS AND DESIGN OF A SHOPPING COMPLEX BUILDING USING STAAD PRO

A PROJECT REPORT

Submitted by

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INTERNAL EXAMINER

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ABSTRACT

The objective of this project work is to apply the concept of theoretical knowledge obtained during the course of study to design a shopping complex Building. The project deals with design of G+2storied reinforced concrete framed structure of a shopping complex with an area of 374m^2 and the total land area is 420m^2. The frame consists of beams, columns, slabs, footings, staircases. The dimensions and loading are given as input data in STAAD Pro, then the building is modeled and analyzed. Then the frame is loaded with suitable load and those load calculations are done as per Indian Standard code. The analysis is compared with the manual calculation as the design match with almost similarity. The plan of the building is drawn in the AutoCAD, analyzed and designed using STAAD Pro. Finally, reinforcement detailing is drafted in AutoCAD. Thus, the design of G+2 shopping complex for dead load, live load and the load combination is done satisfying the requirements of IS 456:2000 (Limit state Method). The calculations fulfill the requirements of IS 875: part 1 to Part 5, SP 16.

CHAPTER 7

CONCLUSION

In this project we have made an attempt to design a commercial office building as framed structure. The framed structure for the building analyzed and designed using STAAD Pro software and drafting of plan, reinforcement through Auto CAD. The shear force and bending moment diagram of the structure is done. All the members are designed by limit state method. Indian standard codes are used for the loadings and load combinations Detailing of each structural member was done using Auto CAD The structure analyzed in STAAD Pro is compared with manually determined results

The project work is done in such a manner so as to cover all major work of design. During the course of the project work we have gained much knowledge about analysis & design of slab, beam, column, staircase, and Footing. The design of structure is done manually as per standards of IS 456-2000, in addition we have learnt the applications of AUTO CAD And STAAD Pro during the course of this project

ANALYSIS AND DESIGN OF A G+2 APARTMENT BUILDING

A PROJECT REPORT

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in

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M.I.E.T. ENGINEERING COLLEGE, TIRUCHIRAPPALLI

ANNA UNIVERSITY:CHENNAI-600 025

NOVEMBER 2023

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ABSTRACT

This project work is to apply the concept of theoretical knowledge obtained during the course of study to **"DESIGN THE G+2 APARTMENT BUILDING"**. The project deals with the design of G+2 apartment space reinforced concrete frame structure of apartment building. The frame consists of beams and columns. Then the frame is loaded with suitable load after load calculation are done as per IS code. If the structure fails according to analysis, a few changes introduced in the geometry of the structure and the loading are applied and analysis is done. If the structure does not fail, full design details are obtained in STAAD PRO V8i for columns, beams. The plan of the building drawn in the **AutoCAD**, designed using **STADD Pro.**

Hence, the design of G+2 apartment building for dead load, live load, the load combination is done by using IS-code

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CHAPTER 7

CONCLUSION

The analysis of the structure is done using STAAD PRO according to which the structure is safe and reliable. Hence the design details of the G+2 apartment building is obtained. The drafting works are done with AutoCAD. The structural designs of the structure is done with STAAD PRO . The shear force, bending moment and deflection occurred in this structure, caused by the loads are within the limits so the structure can carries heavy loads without any cause of failures or damages.

We have acquired an idea of structural designs, structural drawings and the source of materials. This project provides us a good theoretical and practical knowledge, which will be useful for our future. This project was very much helpful for us to obtain more knowledge about drafting using Auto CAD and analyzing using-STAAD PRO.

ANALYSIS AND DESIGN OF BIO GAS PLANT USING STAAD PRO

A PROJECT REPORT

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ABSTRACT

India is a developing country with a growing economy, which shows high consumption of goods and years of waste especially in urban areas. In modern times, as the demand for energy grows, the demand for biogas has increased. Many biogas plants have already been established in rural and urban areas and studies show that Biogas will soon replace fossil fuels as a source of energy. This project is centered on the design of Biogas Plant for the institutional campus. Production of biogas can be done using raw materials such as agricultural waste, manure, municipal waste, plant material, sewage, green waste or food waste. In any institute, there are multiple mess and canteen which cater to more than 3000 students daily and generate over 80 kg of solid and semi solid waste in the form of left-over food and remains of vegetables and fruits. In the process of making biogas from biomass, two main products are obtained: i) Methane (55–70 %) and ii) Slurry i.e., organic fertilizer. Methane can be used to light the houses, cook food and as a fuel for vehicles. The organic fertilizers are considered to be more productive than traditional fertilizers and are widely used in fields. The purpose of this biogas plant is to address the problem of waste disposal in canteens and other parts of the campus in an environmentally friendly manner. Various designing factors such as size, site selection, raw materials supply and output calculations are done in the project to meet the requirements. The size of the plant is determined by collecting data of solid mass and semi solid mass generated as waste and plant required to process the raw materials into biogas effectively.

CHAPTER 7

CONCLUSION

- As stated in the starting pages of project report (abstract), a comprehensive work on the design & detailing of the ANAEROBIC BIOGAS REACTOR with more care and sincerity.
- In this project we have made an attempt to design biogas tank with dome as circular structure. The circular structure of the tank is analyzed using STAAD Pro software and design through AUTO CADD. The shear force and bending moment diagram done. Indian standard codes are used for loading combinations. Detailing of each structural member was done using Auto CADD. The structure analyzed in STADD PRO is compared with manually determined result. We have done our best by collecting as much data as possible and have utilized same for designing.
- We do hope that each and every chapter of this project.
- The project is done in such a manner so as to cover all major work of designing a biogas reactor. During the course of the project work we have gain much knowledge about analyzed and design of a biogas circular tank and a dome.

ANALYSIS AND DESIGN OF HOTEL BUILDING (G+8) USING ETABS IN SALEM

A PROJECT REPORT

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ABSTRACT

Salem being the fifth largest urban agglomeration in the state of Tamil Nadu and developing city with a rapid increase in construction field. Hence, there is a need for multistorey building. In this project we mainly deal with analysis and design of multi-story hotel building (G+8) having a total area of 610.56 Sq.m. using ETABS software considering a load of dead loads, imposed load, wind load and seismic load. Salem comes under zone II. The material properties of steel and concrete was assigned as per IS standards. Using the software, we have analysed and designed the beams, columns, slabs, staircase and shear wall. The results are downloaded from the software and compared with manual design as per IS 456-2000.The structure is safe under applied loads.

CHAPTER-11

CONCLUSION

1)E-tabs software design provide adequate strength, durability, serviceability along with economy.

2)E-tabs design is based on limit state method.

3)The force of support reaction is minimum as the response factor taken is zone II.

4)The Dimension of beam or column should be increased as to resist against seismic loads.

5)E-tabs mainly reduces the time & work along with more accuracy.

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ANALYSIS AND DESIGN OF A SECURED PRISON BUILDING

A PROJECT REPORT

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ABSTRACT

The objective of this project work is to apply the concept of theoretical knowledge obtained during the course of study to "Design of Secure Prison Building". The project deals with the design of secure prison space reinforced concrete frame structure of a secure prison building are. The frame consists of beams and columns. Then the frame is loaded with suitable load after load calculation are done as per IS code. If the structure fails according to analysis, a few changes introduced in the geometry of the structure and the loading are applied and analysis is done. If the structure doesn't fail, full design details are obtained in STAAD Pro V8i for columns, beams. The plan of the building drawn in the **Auto CADD**, designed using **STADD Pro.** Hence, the design of secure prison building for dead load, live load, the load combination is done by using IS-codes.

Keywords: Reinforcement, Concrete, Brick wall, Structure, Building, STAAD Pro, Auto CADD & MS-Office.

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CHAPTER 7

CONCLUSION

- Contemporary prison design is a multi-layered and multi-scalar contributor to the prisoners' positive psychological and behavioural change and their acceptance by the common society.
- Based on the considerations as to the meaning and purpose of the contemporary prison, the key qualitative elements of design that impact the re-socialization of inmates are identified.
- These are: Location; Spatial concept and design; Appearance of the prison as a whole; Accommodation cells and blocks; and Content and functionality.
- The study has shown that the socially functional environment of a secured prison may be achieved by applying various design approaches.
- In this regard, the establishment of a common format of new prison architecture seems unnecessary; instead, the model of contemporary prison architecture may actually be interpreted, inter alia, as the spatial response to the ultimate requirement for re-socialization.
- On this point, the set of indicators, established in order to analyse the response of contemporary cases, may be used to determine the potential for re-socialization of older existing facilities, with the aim of future improvement.
- Finally, these same indicators may also be used as guidelines in new prison planning and design.

ANALYSIS AND DESIGN OF GAS STATION

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ABSTRACT

In this project, our aim is to conceptualize a gas station facility capable of accommodating 1000 vehicles, catering to the needs of consumers. The design adheres to the National Building Code (NBC), with structural analysis conducted through Staad Pro. The components, including Footing, Column, Beam, and Slab, are meticulously designed using the limit state method outlined in IS456-2000.

The gas station, covering an area of 357 sqm (3,740 sqft), is equipped to handle dead load, live load, and wind load according to IS-code specifications. The comprehensive load combination analysis ensures structural integrity.

PERFORMANCE IMPROVEMENT IN CONCRETE BY USING FOUNDRY SAND AS A FINE AGGREGATE

A PROJECT REPORT

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ABSTRACT

The concrete industry is constantly seeking innovative solutions to address sustainability challenges while maintaining performance standards. Foundry sand, a by product of metal casting processes, presents an opportunity for sustainable utilization in concrete production. It explores the feasibility and benefits of incorporating foundry sand as a fine aggregate in concrete mixtures.

Foundry sand possesses desirable properties such as high compressive strength, low absorption, and good workability, making it a potential substitute for natural fine aggregates. Moreover, its abundant availability and low cost contribute to its attractiveness as a sustainable alternative.

This study investigates the effects of varying proportions(10%,20%,30%,40%) of foundry sand on concrete properties, including strength, durability, and workability. Experimental results demonstrate that concrete mixtures containing foundry sand meet or exceed standard requirements, indicating its potential as a viable alternative to conventional fine aggregates.

Furthermore, utilizing foundry sand in concrete reduces the environmental impact associated with its disposal, alleviating the burden on landfills, and conserving natural resources. The incorporation of foundry sand also contributes to energy savings and emissions reduction, aligning with the principles of sustainable development.

Adding 30% foundry sand in concrete gives comparatively high results the integration of foundry sand as a fine aggregate in concrete presents a promising avenue for enhancing the sustainability of construction practices.

CHAPTER 6

CONCLUSION

The incorporation of foundry sand as a replacement for fine aggregate in concrete production has been explored through a series of compressive strength tests. The findings indicate a noteworthy influence on the mechanical properties of the resulting concrete mixes.

Initially, as the proportion of foundry sand increased from 10% to 30%, there was a noticeable enhancement in compressive strength. This trend suggests that foundry sand can positively contribute to the overall strength characteristics of concrete. However, the compressive strength values plateaued or slightly decreased when the foundry sand content reached 40%. This deviation from the expected trend could be attributed to various factors such as particle size distribution, shape, and chemical composition of the foundry sand.

Moreover, the performance of concrete mixes containing foundry sand exhibited variability across different replacement levels. While the 30% replacement level showcased the highest compressive strength values, the 40% replacement level experienced a decline in strength, albeit remaining comparable to conventional mixes. This suggests that there might be an optimal replacement percentage beyond which further addition of foundry sand may not yield significant improvements or could even result in detrimental effects on concrete strength.

Additionally, factors beyond compressive strength, such as durability, workability, and environmental impacts, should be thoroughly investigated to assess the overall suitability of foundry sand as a fine aggregate replacement in concrete. Environmental considerations, including the potential for

EXPERIMENTAL INVESTIGATION OF SHEAR STRENGTH OF EPOXY- MODIFIED LONGITUDINALLY REINFORCED CONCRETE BEAMS

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ABSTRACT

This research investigates the influence of incorporating epoxy into concrete, with a specific focus on its effects on flexural performance and strength characteristics. Structural systems often necessitate high-strength beams capable of enduring significant deflection while maintaining superior flexural strength. The study rigorously examines the impact of epoxy inclusion on compressive strength, split tensile strength, and flexural strength parameters.

Through experimental investigation, it is observed that adding epoxy leads to significant enhancements in compressive and Split Tensile strengths, with increases ranging from 14.93% to 42.91% and 18.75% to 48.13%, respectively, as epoxy content rises from 5% to 30%. This highlights epoxy's efficacy as a strengthening agent in concrete mixes. Furthermore, considering the balance between cost and strength, a 20% epoxy content emerges as the most advantageous, offering substantial strength improvements while remaining cost-effective for diverse construction applications.

Moreover, epoxy incorporation consistently enhances Ultrasonic Pulse Velocity (UPV) by 14.93% to 42.91%, with optimal enhancement observed at 20% epoxy content. The post-cracking behavior of epoxy-modified concrete (EMC-B1) demonstrates distinct advantages over standard concrete (CN-B), potentially influencing strength and ductility. However, detailed analysis is warranted to accurately quantify these enhancements.

Experimental evidence from beam tests confirms the superior performance of epoxy-modified concrete, showcasing enhanced strain tolerance, delayed cracking, and superior load-bearing capacity compared to standard concrete. In conclusion, epoxy incorporation significantly improves compressive strength, Split Tensile strength, UPV results, and post-cracking behavior in concrete. The optimal 20% epoxy content strikes a balance between strength enhancement and cost-effectiveness, making it a practical choice for construction projects requiring enhanced performance and durability. These findings underscore the value of epoxy-modified concrete in high-strength structural applications, highlighting its potential as a valuable material in the construction industry.

CHAPTER 5

CONCLUSION

An experimental investigation into the shear strength of epoxy-modified longitudinally reinforced concrete beams was conducted in this research. Various parameters related to strength, durability, ultrasonic pulse velocity, and SEM-EDAX analysis were examined to assess their efficiency. The following observations were made during the investigation:

- Adding epoxy leads to substantial enhancements in compressive and Split Tensile strengths, with increases ranging from 14.93% to 42.91% and 18.75% to 48.13%, respectively, as epoxy content rises from 5% to 30%. This demonstrates epoxy's efficacy as a strengthening agent in concrete mixes.
- Considering the balance between cost and strength, a 20% epoxy content emerges as the most advantageous, offering significant strength improvements while remaining cost-effective for various construction applications.
- Furthermore, beyond mechanical strength, epoxy incorporation consistently enhances Ultrasonic Pulse Velocity (UPV) by 14.93% to 42.91%, with optimal enhancement observed at 20% epoxy content.
- The post-cracking behavior of epoxy-modified concrete (EMC-B1) shows distinct advantages over standard concrete (CN-B), potentially influencing strength and ductility.
- Experimental evidence from beam tests confirms the superior performance of epoxy-modified concrete, exhibiting enhanced strain tolerance, delayed cracking, and superior load-bearing capacity compared to standard concrete.

AN EXPERIMENTAL INVESTIGATION ON EXPLORING THE VIABILITY OF GLASS FIBER REINFORCED POLYMER REBARS AS AN ALTERNATE TO STEEL REINFORCEMENT IN CONCRETE BEAMS

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ABSTRACT

In the present years, due to enhanced properties of Glass Fiber-Reinforced Polymers (GFRP) there has been a rapid increase in usage of GFRP reinforcing bars for concretestructure.

The GFRP bars have been used extensively in the marine structures where the conventional steel reinforcement which is affected by corrosion is more overriding. After all these years of investigation and implementation, researchers have concluded GFRP as the corrosion resistant reinforcing material in the corrosion protection policies. However, they may suffer of degradation when exposed to specific aggressive environments and when subjected to long-term sustained stress.

To increase their durability, design guidelines available in the literature limit the stress level in the rebar. However, such limitations are based on few experimental results and represent conservative estimation of the bar long-term behavior. In this paper, the results of 9 short-term tensile tests and 17 long-term tensile tests on GFRP bars are presented. The functions proposed allow for obtaining the long term relaxation losses of the reinforcing bars for different stress levels.

The Flexural test has been conducted experimentally for both the beams and the results which were obtained from experimentally are compared with analytical results which are obtained using analysis.

CHAPTER 5

CONCLUSION

- GFRP reinforcing bar has higher tensile strength and higher corrosion resistance than steel rebar in addition, moderate flexural strength, these properties make GFRP is good alternative of steel in foundations application.
- Tensile strength of bare GFRP bar is high, because they are anisotropic composite materials, GFRP rebar achieved yield tensile strength about 13% higher than that the steel rebar, while yield strain of GFRP is higher than steel about 58%. Tensile strength of bare GFRP bar is high, because they are anisotropic composite materials.
- GFRP rebar achieved yield tensile strength about 13% higher than that the steel rebar, while yield strain of GFRP is higher than steel about 58%. Compressive strength of unreinforced concrete is 25.67 MPa, this value is acceptable according to British Standard specification.
- Great changes take place in the stress–strain relation of GFRP-RC beams under the design limit state and the ultimate limit state. By setting the concrete compressive strain at the extreme compression fiber of concrete as 0.001, the equivalent rectangular stress block coefficient, the depth of the concrete compressive zone, and the strain of the tensile bar are calculated again
- Comparing the conventional steel rebar and the GFRP rebar, the GFRP rebar is double the tensile strength of the steel rebar and quarter the weight of the steel rebar.

EXPEREMENTAL INVESTIGATION OF CONCRETE AS FINE AGGREGATE REPLACED BY FOUNDRY SAND ADDING NANO SILICA

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ABSTRACT

This study investigates replacing traditional fine aggregate with foundry sand and adding nano silica to concrete. Foundry sand, a byproduct of metal casting, offers a sustainable alternative to natural sand, while nano silica enhances concrete properties. The integration aims to enhance concrete performance and sustainability. Through comprehensive analysis, including experimental evaluation, the study assesses the effects on compressive strength properties for various proportions of 10,20,30and40 percentage with adding of 1to 4 percent of nano silica. Results show that substituting fine aggregate with foundry sand improves mechanical properties, further refined by nano silica. Additionally, this approach offers cost savings and environmental benefits by utilizing industrial byproducts and reducing natural resource consumption.30% of foundry sand replacement and 3% nanosilica gives better result Overall, integrating foundry sand and nano silica into concrete mixtures presents a promising strategy for sustainable enhancement of concrete structures, warranting further research for optimization and widespread adoption.

CHAPTER 6

CONCLUSION

The integration of foundry sand as a substitute for traditional fine aggregate and the incorporation of nano silica into concrete present a compelling approach to enhance the performance and sustainability of concrete structures. This combination offers multifaceted benefits.

Replacing fine aggregate with foundry sand not only utilizes a waste material, diverting it from landfills, but also enhances concrete properties. Foundry sand can improve compressive and flexural strength, as well as durability. Nano silica further amplifies these advantages by reduced microcracking.

Moreover, this approach contributes to sustainability by reducing reliance on natural resources and lowering production costs. Foundry sand is often more affordable than natural sand, while nano silica optimizes cement consumption, potentially reducing long-term maintenance expenses.

Additionally, the incorporation of nano silica enhances workability, facilitating easier placement and compaction of concrete mixes. It also fortifies concrete against environmental degradation, prolonging service life and mitigating corrosion risks in aggressive conditions.

By adding various proportions, 30% foundry sand and 3% nano silica . gives better compression strength result compared to conventional concrete.

In conclusion, the amalgamation of foundry sand and nano silica presents a promising for advancing concrete technology, offering a sustainable, cost-effective, and durable solution for construction applications..

RADON GAS EMISSION FROM CULTIVATED AND UNCULTIVATED SOIL SAMPLES

A PROJECT REPORT

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ABSTRACT

This study aims to generate a database on the radioactivity content of the cultivated and uncultivated soil samples and used in Karur District employing a high-resolution NaI (Tl) detector. Twenty-five types of cultivated and uncultivated soil samples were collected from the different places in Karur district. The results indicated that Ra226, Th232, and K40 concentrations in the building materials of the study area were found to vary from below detection limit (BDL) to 3060Bq/kg in Nilakani and 148Bq/kg in Thanillai for Cultivated Soil and 2158Bq/kg in Velliyanai and 115Bq/kg in Sinthamanipatti. Other radiation hazard indices, like radium-equivalent activity, absorbed dose rate, external and internal hazard indices, indoor and outdoor effective doses, and radioactivity level index, were also calculated. Soil samples such as cultivated and uncultivated show a higher level of radium-equivalent activity. Hence, the use of Cultivated soil samples needs to be avoided, and the other uncultivated soil sample used from this district posed no radiological risk to human populations.

CHAPTER 5

CONCLUSION

The Can technique using is a passive and convenient useful tool for determining the radon exhalation rates as well as the radium contents in some sample of building materials. The results obtained in this survey for local soil samples like cultivated and uncultivated soils similar to some available data for building materials reported in literature. Effective ^{222}Rn concentrations ranged from 3060 to 148 Bq kg^{-1} for cultivated and 2158 to 115 Bq kg^{-1} uncultivated soil. The values of radon exhalation rate and radium content are found under the safe limit recommended by Organization for Economic Cooperation and Development. Hence it can be concluded that the study area is safe from the health hazard of radium point of view. It is possible to establish a data base for all building materials available in a local market using this technique with low cost for a large-scale nation-wide indoor radon screening measurement.

EXPERIMENTAL INVESTIGATION ON THE BEHAVIOUR OF CFS BUILT-UP I SECTION COLUMNS

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ABSTRACT

The widespread adoption of steel structures in construction is attributed to their simplicity, rapid construction, and ease of handling. Cold-formed steel, in particular, is gaining traction due to its use of thin gauge sheets, resulting in lighter structures that offer significant material and cost savings compared to conventional steel structures. However, optimizing a cost-effective cross-section capable of bearing heavier loads without buckling poses a challenge. This study aims to investigate the impact of stiffeners on the performance of cold-formed steel columns. Experimental tests were conducted on two long columns one with stiffeners and one without both featuring back-to-back lipped channel sections (100 x 40 x 15 x 2). A finite element model was developed and validated against experimental and theoretical results, employing methods such as the effective width and direct strength methods outlined in IS codes IS 801, IS 811, and BS 5950. Results indicate that intermediate V-shaped web stiffeners enhance both distortional and local buckling strength, with stress-strain curves exhibiting nonlinear behavior. Despite not altering the section's dimensions or material, the inclusion of stiffeners led to a 26% increase in strength. This model can serve as a basis for further parametric studies, facilitating the development of more efficient sections.

CHAPTER 7
CONCLUSION

- In this study, 2 experiments and 2 FE models of numerical studies were carried to and are validated through literature to understand the axial load carrying capacity and structural behaviour of the designed CFS built-up column with same heights with various cross sections. The failure modes, axial load carrying capacity and load against lateral deflection were discussed.

- The FE model shows good agreement with the experiment outcomes. Since the modified slenderness ratio of the all the columns fall under 8 to 60, the CFS built-up column can be used as long columns and intermediate columns in construction.

- An experimental and numerical investigation of cold formed steel built up section with intermediate stiffener has been described. The test specimen was fabricated using high strength zinc coated grade and with nominal yield stress of 240 N/mm^2 respectively. The failure mechanisms and load vs. deflection characteristics were studied. The experimental findings and the analytical result from ABAQUS 6.14 are compared.

- The experimental investigation was carried out for the columns of height 900mm with two specimen. The experimental and FEA results are compared. The graphs that shows the load in kN vs deflection in mm for the column heights of 900mm respectively. Also, table shows the comparison of experimental and FEA load values of the columns respectively.

FEASIBILITY OF USING THREE-STEPPED MESH BOX GABION FOR COASTAL PROTECTION IN VELANKANNI

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ABSTRACT

This study investigates the performance of a three stepped gabion box structure in diverse scenarios aimed at coastal protection in the 'Velankanni' region. Emphasizing sustainability, the investigation entails scaled-down gabion boxes, meticulously engineered and filled with a range of materials including natural aggregates and recycled concrete, subjected to fluctuating water table levels.

Model gabion boxes of dimensions 0.17 x 0.17 x 0.17 m were prepared with two different types of meshes namely square shaped mesh and diamond shaped mesh. These are filled with different proportions of coarse aggregate and demolished concrete waste. From the experimental investigation, the necessary input parameters for Geosynthetics and Gabion boxes were obtained for the Finite Element Modelling. PLAXIS 2D was employed to model the three stepped gabion box. A total height of 2.8 m and a breadth of 4 m was considered, with each gabion box of dimension configured as 0.7 x 1 m.

Results indicate that stress points at the bottom of the gabion geometry experienced the greatest total horizontal and vertical displacements due to wave action for both aggregate and demolished concrete waste infill. Lower water table levels were found to result in higher effective stress within the gabion for both infill materials, suggesting increased stability. Analysis of gabion infill materials revealed that a 60% aggregate and 40% demolished concrete waste mixture showed potential benefits in terms of the factor of safety for the gabion model.

This study suggests that gabion structures can effectively mitigate soil movement in submerged as well as dry condition, with aggregate infill potentially offering advantages in terms of stiffness and load capacity. Stress point location closer to gabion geometry and water table levels were identified as significant monitoring parameters influencing the performance.

Further research avenues could explore the long-term behavior of gabion structures under repeated wave action and investigate the influence of different aggregate gradations and packing densities on their effectiveness. The findings support the conclusion that a 60:40 (Aggregate : Demolished concrete waste) mixture is more suitable in terms of sustainability and durability aspect of gabion structures.

CHAPTER 7

CONCLUSION

The PLAXIS 2D modeling and compression tests investigated the behavior of gabion structures filled with either aggregate or demolished concrete waste under wave action and varying water table levels. The key findings are summarized below:

- **Wave Action and Displacement:** Stress points at the bottom of the gabion geometry (D & E) experienced the greatest total horizontal and vertical displacements due to wave action for both aggregate and demolished concrete waste infill.
- **Water Table and Effective Stress:** Lower water table levels resulted in higher effective stress within the gabion for both infill materials. This suggests that lower water tables lead to increased stability of the gabion structure.
- **Gabion Infill Material and Performance:** While both infill materials exhibited wave-induced displacements, the results from Figure 6.8 suggest a potential benefit for a 60% aggregate and 40% demolished concrete waste mixture in terms of the factor of safety for the gabion model.

Compression Test Results:

- The Young's modulus (E), a measure of stiffness, was approximately 800 kN/m² for demolished concrete waste infill and 1200 kN/m² for aggregate infill. This aligns with the values used in the PLAXIS modeling.
- The compression tests showed higher load-bearing capacity for gabions filled with aggregate compared to demolished concrete waste.

Overall, the study suggests that gabion structures can be effective in mitigating wave-induced soil movement, with aggregate infill potentially offering advantages in terms of both stiffness and load capacity. However, the location of stress points within the gabion geometry and the water table level significantly influence the overall performance.

Further research could explore the long-term behavior of gabion structures under repeated wave action and investigate the influence of different aggregate gradations and packing densities on their effectiveness.

ADVANCING COASTAL RESILIENCE: EXPLORING DIVERSE GROYNE STRUCTURES WITH RECYCLED MATERIALS AND GEOTEXTILES IN DHANUSHKODI USING PLAXIS 2D

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ABSTRACT

This study explores the design and optimization of groyne structures to protect the coastline of Dhanushkodi. Through a comprehensive analysis of various models, incorporating considerations of efficiency and sustainability, an optimal configuration is determined. Utilizing concrete demolished waste and waste steel slag in groyne construction, the stability of these structures is rigorously assessed, culminating in the identification of the most effective model.

Key findings reveal the critical influence of groyne geometry on stability, emphasizing the importance of width and depth in minimizing displacement. Additionally, the impact of the water table on structural stiffness and displacement is examined, highlighting the need for careful consideration in design.

Four distinct models are analyzed,

i) Armour layer Coarse aggregate + (Core Layer Coarse aggregate with Sand).
ii) Armour layer Coarse aggregate + (Core Layer Demolished waste with Steel slag).
iii) (Armour layer Demolished waste with Steel slag) + Core Layer Coarse aggregate.
iv) (Armour layer Demolished waste with sand) + Core Layer Coarse aggregate.

The highest factor of safety of 1.5 is observed in a configuration featuring coarse aggregate in the armour layer and a mixture of coarse aggregate with sand in the core layer. Incorporating demolished waste and steel slag in the core layer within Geobags yields a sustainable solution with a factor of safety of 1.4.

Hence, the utilization of geobags filled with demolished concrete waste and steel slag in the core layer exhibits a commendable factor of safety at 1.4. This innovative approach not only addresses the issue of waste management by repurposing construction remnants but also enhances sustainability in civil engineering practices. By integrating recycled materials into infrastructure projects, this method showcases a commitment to environmental responsibility, contributing positively to the circular economy and reducing the ecological footprint of construction activities.

CHAPTER 7

CONCLUSION

In this study, a groyne structure is designed to safeguard the coastline of Dhanushkodi. Various models, considering efficiency and sustainability, are analyzed to determine an optimal configuration. Four practical models are considered, with the construction of groynes incorporating the efficient utilization of concrete demolished waste and waste steel slag obtained during steel manufacturing. The stability of the groyne when utilizing these materials is thoroughly assessed, leading to the finalization of the optimum model.

- It is observed the geometry of the Groyne model plays a vital role in the stability. A wider or deeper Groyne experienced less displacement compared to a narrower or shallower one under similar stress conditions.
- The next crucial parameter is the water table which largely affects the stability of the structure. Models with higher water table tend to be less stiff and more prone to displacement.
- Groynes with lesser lateral and vertical displacements has proved to have a higher factor of safety. This holds true for all models analyzed under various water level conditions.
- Four different models are analysed in this study namely

    i) Armour layer Coarse aggregate + (Core Layer Coarse aggregate with Sand).

    ii) Armour layer Coarse aggregate + (Core Layer Demolished waste with Steel slag).

    iii) (Armour layer Demolished waste with Steel slag) + Core Layer Coarse aggregate.

    iv) (Armour layer Demolished waste with sand) + Core Layer Coarse aggregate.

REVOLUTIONIZING ROADWAYS: HARNESSING THE STRENGTH OF PLASTIC WASTE IN BITUMINOUS MIXES FOR SUSTAINABLE PAVEMENT SOLUTIONS

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ABSTRACT

This study investigates the integration of plastic waste, specifically Low-Density Polyethylene (LDPE) and High-Density Polyethylene (HDPE), into bituminous mixes for sustainable pavement solutions. Through comprehensive analysis, various parameters including air voids, voids in mineral aggregates (VMA), voids filled with bitumen (VFB), and Marshal stability are evaluated to assess asphalt mix performance and durability.

Increasing bitumen content from 5% to 7% results in significant alterations, with air voids decreasing from 8.13% to 3.63%, and VMA slightly increasing from 23.04% to 24.52%. The percentage of VFB consistently rises from 64.81% to 85.25%, indicating improved bitumen bonding. Marshal stability also shows an overall uptrend, indicating enhanced resistance to deformation.

LDPE and HDPE with varying waste percentages exhibit fluctuations in air voids and Marshal stability, highlighting the complex relationship between plastic waste percentage and asphalt mix properties. Additionally, the influence of plastic waste on void characteristics such as VMA and VFB varies between LDPE and HDPE.

Tests on aggregates and bitumen provide crucial data on physical and mechanical properties essential for asphalt mix quality and performance.

CHAPTER 5

CONCLUSIONS

The comprehensive analysis conducted on the volumetric properties of bituminous concrete mixes, coupled with the investigation into the influence of plastic waste on these properties, has yielded valuable insights essential for optimizing pavement performance and durability.

- In examining the relationship between bitumen content and various volumetric properties, it was observed that as the bitumen content increased from 5% to 7%, significant alterations occurred. Air voids (AV) decreased steadily from 8.13% to 3.63%, indicating a denser composition with higher bitumen content. Conversely, Voids in Mineral Aggregates (VMA) exhibited a slight increase from 23.6% to 24.5%, suggesting a marginal increase in the space available for bitumen within the mix. The percentage of Voids Filled with Bitumen (VFB) showed a consistent rise, ascending from 64.8% to 85.2%, indicating improved bitumen bonding and filling capacity. Marshal stability also displayed an overall uptrend, suggesting enhanced resistance to deformation and improved structural integrity with increased bitumen content.
- Furthermore, the investigation into the impact of plastic waste on asphalt mix properties revealed intriguing findings. LDPE (low-density polyethylene) and HDPE (High-density polyethylene) with varying waste percentages demonstrated fluctuations in air voids and Marshal stability. LDPE stability increased from 12.51 to 14.7 kN as waste percentage rose from 4% to 8%, while HDPE stability varied more, peaking at 15.51 kN with 8% waste. Both materials exhibited fluctuations in stability with increasing waste content, highlighting the complex relationship between plastic waste percentage and asphalt mix properties.
- Moreover, the influence of plastic waste on void characteristics such as VMA and VFB varied between LDPE and HDPE. While LDPE's VMA decreased slightly from 22.45% to 22.4%, HDPE's VMA showed more variation, ranging from 21.85% to 22.62%. Similarly, fluctuations in VFB were observed with increasing plastic waste content for both LDPE and HDPE, suggesting the potential influence of plastic type on void characteristics within asphalt mixes.
- Additionally, tests on aggregates and bitumen provided crucial data on specific gravity, water absorption, abrasion resistance, impact resistance, sieve analysis, flakiness index, elongation index, ductility, softening point, penetration, and viscosity. These tests offer insights into the physical and

OPTIMIZING THE USE OF GROUNDNUT SHELL ASH IN CONCRETE THROUGH EXPERIMENTAL INVESTIGATION

A PROJECT REPORT

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ABSTRACT

This study investigates the optimization of groundnut shell ash (GSA) incorporation in concrete through empirical examination. With a expanding interest in sustainable construction materials, there has been a notable focus on exploring GSA's potential as a partial substitute for cement in concrete compositions. Within this research project, various proportions of GSA were introduced as replacements for cement (ranging from 0% to 30%). SEM analysis of GSA reveals its material properties closely resembling those of cement. The compressive strength, split tensile strength, and flexural strength tests conducted on the Groundnut Shell Ash concrete exhibit a gradual decline with increasing GSA content, through maintaining proximity to the requisite characteristic strength up to a 20% replacement level. However, beyond this theres hold, a sudden reduction in the strength of GSA concrete is observed. SEM and EDX analyses of the GSA concrete sample illustrate a dispersed particle image, indicating the dispersion of compounds responsible for internal particle binding, thereby influencing strength characteristics.

CHAPTER 6

CONCLUSION

6.1. GENERAL

In summary, integrating Groundnut Shell Ash (GSA) into concrete shows promising prospects for improving mechanical properties while advancing sustainability in construction. Compressive strength tests on cube specimens revealed a significant increase over time, with a slight decrease noted at higher GSA levels up to 20% replacement, indicating proximity to the required strength. Similarly, split tensile tests on cylinder specimens displayed a gradual decline in strength with increasing GSA content, yet maintaining closeness to desired levels at lower replacement rates. Flexural strength tests on beam specimens followed a comparable pattern, with sufficient strength retention up to 20% GSA replacement. Examination of SEM micrographs provided valuable insights into the microstructural features, highlighting a heterogeneous matrix with well-dispersed GSA particles exhibiting good bonding with the cementitious matrix. Moreover, evidence of pozzolanic reaction between GSA and calcium hydroxide was evident, resulting in additional C-S-H gel formation, densification, and refinement of pore structure. However, the presence of unreacted GSA particles and voids underscores the importance of optimizing GSA content and processing parameters for maximal densification and strength enhancement. Hence, harnessing GSA in concrete presents a feasible pathway for sustainable construction, subject to careful optimization to unlock its full potential.

AN EXPERIMENTAL STUDY OF COST-EFFECTIVE GREY WATER TREATMENT SYSTEM

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ABSTRACT

This study investigates the efficacy of a multi-stage filtration system for the treatment of greywater, focusing on the removal of contaminants to achieve safe and environmentally friendly reuse. The proposed system integrates various filtration media, including gravel, sand, p sand, cotton and activated carbon to address different types of pollutants present in greywater. Through laboratory experiments and analysis, the performance of the filtration system is evaluated in terms of its ability to remove suspended solids, organic matter, pathogens, and chemicals. Results demonstrate significant reductions in Turbidity, Biochemical Oxygen Demand, Total Suspended Solids, pH, Total Solids, Total Dissolved Solids, Chemical Oxygen Demand, Chlorides, Total nitrogen, Dissolved Oxygen, indicating effective purification of greywater. Moreover, the incorporation of activated carbon enhances the removal of organic compounds and odors further improving the quality of treated water. Overall this research highlights the potential of multi-stage filtration systems for enhancing the treatment efficiency of greywater, promoting sustainable water management practices and mitigating environmental impacts.

CHAPTER 7

CONCLUSION

- This study focuses on the development of a low cost grey water treatment.
- The developed treatment system is effective in treating grey water from laundry & shower sources.
- The high removal efficiencies of Turbidity, BOD & COD indicate that the system is effective in treating grey water.
- The system achieved more then 88% of BOD removal and more than 89% of COD removal.
- This system is easy to maintain & does not require addition of chemicals. This reduce operational costs & simplifies system maintenance.
- The planned bio filter gives better results for the removal of Chloride, Nitrogen, Total solids.
- Total dissolved solids get reduce from (392mg/Lto208mg/L).
- The planned bio filter gives better result.
- This method gives better efficiency then other non-planned filters.
- The efficiency from bio filtration can be effectively recycled & reuse for sprinkling, toilet flushing & recharging for water.

EXPERIMENTAL STUDY ON PARTIAL REPLACEMENT OF CEMENT WITH CASHEW NUT SHELL ASH IN CONCRETE

A PROJECT REPORT

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of

BACHELOR OF ENGINEERING

in

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ABSTRACT

This experimental study investigates the feasibility and performance of incorporating cashew nut shell ash (CNSA) as a partial replacement for cement in concrete mixtures. The research explores the influence of varying percentages of CNSA on the mechanical properties, durability, and environmental impact of the resulting concrete. Through a series of laboratory experiments, the study aims to provide insights into the potential of CNSA as a sustainable alternative in the construction industry, addressing both economic and environmental aspects. The findings contribute valuable information for optimizing concrete mixtures with renewable materials, fostering sustainable practices in the field of construction.

Replacing a portion of cement with cashew nut shell ash (CNSA) in concrete has gained attention due to its potential environmental and economic benefits. This abstract will explore the effects of CNSA on concrete properties, such as strength, durability, and workability, through a comprehensive review of existing literature and experimental studies. The abstract will also discuss the feasibility and sustainability of utilizing CNSA in concrete production, considering factors such as availability, cost-effectiveness, and environmental impact.

(EDAX) and scanning electron microscope (SEM) analyses explored the microstructural and mineralogical aspects which indicated that Cashew Nut Shell Ash (CNSA) is having similar properties to that of cement. Maintaining the constant fluid-binder proportion of 0.5, cement is substituted by CNSA as 5, 10, 15,20,25 and 30% by weight to study the fresh and hardened properties of M20 concrete through compression test, split tensile test and flexural strength test.

CHAPTER 6

CONCLUSION

- The experimental study on partial replacement of cement with cashew nut shell ash has yielded promising results.
- Overall, this study suggests that cashew nut shell ash can be a viable supplementary material in cementitious systems, contributing to sustainable construction practices.
- Through various studies and experiments, it has been concluded that CNSA can effectively enhance the properties of concrete, such as improving compressive strength and durability.
- The addition of cashew nut shell ash (CNSA) at a 25% replacement level in concrete has demonstrated several promising outcomes. Additionally, the incorporation of CNSA contributes to sustainability efforts by utilizing a waste by-product from the cashew industry.
- Chemical composition of CNSA is similar to cement, so hence we replace cement with cashew nut shell ash.
- Overall, the use of CNSA at a 25% replacement level in concrete presents a viable and eco-friendly solution for enhancing concrete performance while reducing environmental impact.
- The SEM (Scanning Electron Microscopy) test results for adding cashew nut shell ash in concrete typically show improved microstructure due to the pozzolanic reaction, resulting in better interlocking of particles and potentially enhanced durability of the concrete.
- The Energy Dispersive X-ray Analysis (EDAX) test results for concrete incorporating cashew nut shell ash (CNSA) typically show changes in elemental composition compared to conventional concrete.

EXHALATION RATE OF RADON GAS EMISSION FROM SOIL SAMPLE AND RED SOIL BRICKS IN KARUR DISTRICT-TAMILNADU

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ABSTRACT

Radon gas is one of the sources of radiation in nature. It is a radioactive gas whose danger lies in the fact that it can enter the human body through breathing, causing possible lung cancer. Radon gas was measured by using Solid State Nuclear Track Detector (SSNTD) technique in 35 locations of different nature, residential, and investigated the exhalation rates from surface soil. The rate of radon gas that escapes from the soil into the atmosphere is called radon exhalation rate. In this study, radon, radium, and both radon surface and mass exhalation rates were measured for 35 samples of soil at four sampling depths (10, 20, 30, and 40 cm) in karur district of Tamilnadu. The alpha emitting gaseous ^{222}Rn and their particulates progenies will be hitting and forming nuclear tracks on the sensitive surface of Solid State Nuclear Track Detector (LR 115 film). For the radon measurement, alpha-sensitive were counted by using Spark Counter (Model: PSC-SC1). While radium concentration measured by well type NaI (Tl) detector. Analysis, shows radon activity vary from 176 to 2273 $Bq.m^{-2}h^{-1}$ for virgin soil, 323 to 1002 $Bq.m^{-2}h^{-1}$ for dwelling soil and 101 to 571.1 $Bq.m^{-2}h^{-1}$ for Red Soil Brick. Overall, radon concentration, radium content and both surface and mass exhalation rate in all sample points present a good correlation and less than global mean average recommendation. The results demonstrated that the radon gas concentrations varied from (100 to 2500 Bq/m^3) and the average value of the radon exhalation rate in soil was 0.026 $Bq/m^2.h$. The results can be used as baseline data to evaluate any changes in the radioactive background level due to human activities Radon is a naturally occurring radioactive gas; generated during the decay process of radium, when alpha particles start to be emitted, turning the radium into radon.

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CHAPTER 8

CONCLUSION

The study on the exhalation rate of radon gas from soil samples and red soil bricks in Karur District, Tamil Nadu, provides significant insights into environmental radon levels and their potential health impacts. The following conclusions can be drawn from the investigation: Radon Emission Levels The radon gas emission rates observed from the analysed soil samples and red soil bricks within Karur District show variation, indicating the heterogeneity in radon potential across different sites. This variation is likely influenced by geological factors, soil composition, and the manufacturing process of the bricks. Radon gas levels and exhalation rates were determined in selected surface soil samples collected from Karur District, Tamil Nadu. In light of these findings, it can be roughly said that the area are safe in terms of its impact on health. Analysis, shows radon activity vary from 176 to 2273 $Bq.m^{-2}h^{-1}$ for virgin soil, 323 to 1002 $Bq.m^{-2}h^{-1}$ for dwelling soil and 101 to 571.1 $Bq.m^{-2}h^{-1}$ for Red Soil Brick. Overall, radon concentration, radium content and both surface and mass exhalation rate in all sample points present a good correlation and less than global mean average recommendation. The results demonstrated that the radon gas concentrations varied from (100 to 2500 $Bq.m^{-2}h^{-1}$) and the average value of the radon exhalation rate in soil was 0.026 Bq /m^2.h. It is concluded that the studied Karur building materials can be used in construction safely from the radio protection point of view.