BUNIYAAD

A TECHNICAL MAGAZINE BY
DEPARTMENT OF CIVIL ENGINERING

AMBALIKA INSTITUTE OF MANAGEMENT & TECHNOLOGY

JANUARY-2025

Ambalika Institute of Management and Technology (AIMT) was established in 2008 as a private engineering and management college in (Mohanlalganj) Lucknow, Uttar Pradesh India and is affiliated to AKTU and BTE and Approved by AICTE. The Lucknow campus is spread over 200 acres and is located near NH-56B, surrounded by lush green field and enhanced by a beautiful lake. The institute is 24 kilometers from Lucknow Railway Station and 20 kilometers from Amausi Airport, Lucknow. It is very well connected to the district headquarters.

Ambalika center of excellence has become the most dominating center delivering high-end technical skills to our engineers to make them highly employable. AIMT, Lucknow is imparting training and joint certification programs of innovative technologies in collaboration with the Industry giants such as Microsoft, KUKA Robotics, Siemens, Ace Micromatics, MTab, and Master CAM etc.

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DEPARTMENTAL VISION

To create high quality civil engineers with knowledge par excellence who may contribute in nation building with highest moral and ethical values as true citizens of a civilized society.

DEPARTMENTAL MISSION

To adapt teaching and learning process that gives student power to think and to analyze

To impart practical knowledge by means of lab exposure and industrial interaction

To conduct co-curricular activities for updation of technological advancement

To impart moral and ethical values by means of various programs

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Head of the Department

NAYNISH PANDEY

M.Tech (Civil Engineering)

B.Tech (Civil Engineering)

I am very pleased that we have successfully published the “July-2024” edition of our departmental magazine “BUNIYAAD”. The technical magazine is a combined effort of the students, faculty members and the magazine team. It gives a overview of the major projects taken up in the department. The Magazine article gives an insight of various aspects of Civil Engineering. This Magazine has served as a platform to students and member of the faculties to present their unique ideas. The Magazine is a sincere effort to bridge the gap between theoretical knowledge and practical application of Civil Engineering.

I would like to congratulate the editorial team and the members of faculty for working together as a team in publishing this Magazine. I hope the Magazine re-energizes the perspective of Civil Engineering and the Magazine is a Success.

Contents

STUDENT'S SPACE

DESIGN AND ANALYSIS OF G+6 MULTISTOREY RESIDENTIAL BUILDING

Introduction The design and analysis of a G+6 multistorey residential building require a comprehensive approach that considers structural integrity, safety, functionality, and sustainability. Modern construction methodologies and advanced computational tools enable engineers to optimize building performance while adhering to regulatory standards and environmental considerations. This article delves into key aspects of designing and analyzing a G+6 residential structure.

1. Architectural and Functional Planning The architectural design of a G+6 building involves space optimization, aesthetics, and user convenience. Key considerations include:

- Floor plan layout to maximize space utilization
- Provision for natural ventilation and lighting
- Integration of common facilities like parking, elevators, and recreational areas
- Compliance with local building codes and regulations

2. Structural Design Considerations The structural design ensures the building's ability to withstand loads and environmental factors. Important factors include:

- **Load Calculations:** Estimation of dead load (self-weight of materials), live load (occupant and furniture loads), and environmental loads (wind, seismic).
- **Material Selection:** Use of reinforced concrete (RCC) or steel framework based on cost and strength requirements

- **Foundation Design:** Choice of shallow or deep foundation depending on soil conditions and bearing capacity.
- **Column and Beam Design:** Optimized placement and reinforcement of columns and beams for load distribution.
- **Slab and Roof Design:** Selection of flat slab, waffle slab, or conventional slab based on structural efficiency and aesthetics.

3. Structural Analysis Structural analysis is crucial to validate the safety and performance of the building. It involves:

- **Finite Element Analysis (FEA):** Computational simulations to assess stress distribution and deformation under various loads.
- **Seismic Analysis:** Consideration of earthquake forces using response spectrum or time-history analysis.
- **Wind Load Analysis:** Evaluation of wind pressure effects on the structure based on local wind speed data.
- **Deflection and Stability Checks:** Ensuring that structural components do not exceed allowable deflection and maintain stability under loads.

4. Construction Techniques and Materials Adopting efficient construction techniques enhances safety and reduces costs. Some key approaches include:

- Use of high-strength concrete and corrosion-resistant steel reinforcements
- Modular construction techniques for faster project completion
- Incorporation of energy-efficient materials and green building concepts
- Implementation of safety measures like fire-resistant materials and earthquake-resistant

design elements

5. Sustainability and Energy Efficiency Modern residential buildings integrate sustainable features such as:

- Rainwater harvesting systems
- Solar panels and energy-efficient lighting
- Proper insulation to reduce heating and cooling loads
- Waste management and recycling initiatives

6. Safety and Regulatory Compliance Ensuring compliance with safety standards and regulations is paramount. The building must adhere to:

- National Building Code (NBC) guidelines
- Fire safety norms and evacuation planning
- Earthquake-resistant design as per seismic zone classification
- Accessibility standards for differently-abled individuals

Conclusion The design and analysis of a G+6 residential building require meticulous planning, advanced engineering methodologies, and adherence to safety and sustainability standards. With the integration of modern construction techniques and computational tools, engineers can develop cost-effective, durable, and environmentally friendly structures that cater to the needs of urban populations. Ensuring structural integrity and user comfort remains the cornerstone of successful multistorey building project.

DESIGN ASPECTS OF FLEXIBLE PAVEMENT & QUALITY CONTROL

Introduction Flexible pavements are widely used in road construction due to their ability to distribute traffic loads efficiently while adapting to subgrade variations. The design of flexible pavements requires careful consideration of material selection, layer composition, and load-bearing capacity. Additionally, quality control measures are essential to ensure the durability and longevity of the pavement structure. This article explores the key design aspects and quality control measures involved in flexible pavement construction.

1. Structural Components of Flexible Pavement Flexible pavements consist of multiple layers that work together to withstand traffic loads and environmental conditions. These layers include:

- **Subgrade:** The natural soil compacted to provide a stable foundation for the pavement structure.
- **Sub-base Course:** A layer of crushed stone or gravel that aids in load distribution and improves drainage.
- **Base Course:** A structurally strong layer that provides additional load support and enhances pavement performance.
- **Surface Course:** The top layer composed of asphalt or bituminous material, offering a smooth and durable riding surface.

2. Design Considerations for Flexible Pavements To ensure optimal performance, flexible pavement design must consider several factors:

- **Traffic Load Analysis:** Estimating the expected volume and weight of vehicles to determine appropriate pavement thickness.
- **Material Selection:** Using high-quality bitumen, aggregates, and stabilizers to enhance pavement durability and resistance to wear.
- **Drainage Design:** Implementing proper drainage systems to prevent water accumulation, which can weaken the subgrade and reduce pavement lifespan.
- **Temperature Considerations:** Accounting for thermal expansion and contraction to mitigate the risk of cracks and premature failures.

3. Quality Control in Flexible Pavement Construction Maintaining quality during construction is crucial for the longevity and safety of flexible pavements. Key quality control measures include:

- **Material Testing:** Conducting regular tests on bitumen, aggregates, and asphalt mixtures to ensure compliance with industry standards.
- **Compaction Control:** Ensuring adequate compaction of each pavement layer to prevent settling and deformation over time.
- **Thickness Verification:** Measuring pavement layer thickness at different stages of construction to maintain uniformity and structural integrity.
- **Surface Smoothness and Skid Resistance:** Evaluating the pavement surface texture to enhance driving comfort and safety.

Conclusion The design of flexible pavements requires a systematic approach that incorporates structural considerations, material selection, and environmental factors. Effective quality

control measures during construction are essential to ensure the longevity and performance of the pavement. By adhering to proper design principles and rigorous testing standards, engineers can develop flexible pavements that provide safe, durable, and efficient transportation solutions.

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FACULTY WISDOM

Assessing Stream Speed under influence of On-street Parking

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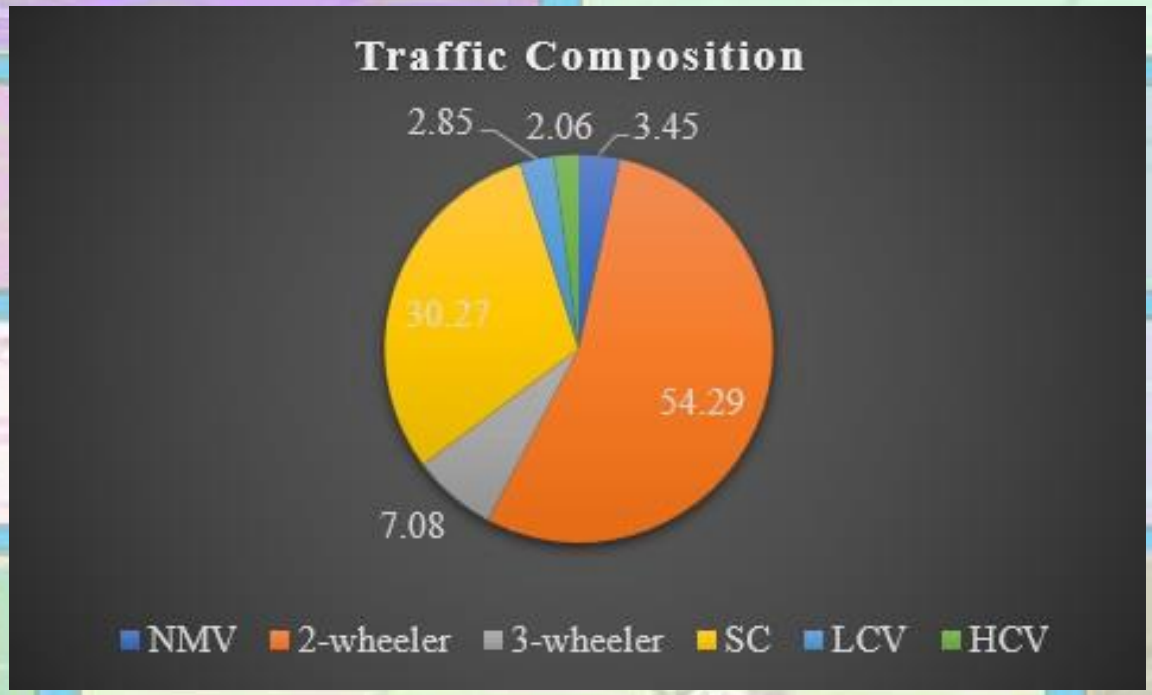
B.Tech (CIVIL ENGINEERING)

Need of Study: Stream speed pattern of traffic plays a crucial role in urban transportation. The presence of on-street parking significantly reduces this speed by narrowing the carriageway width available for traffic movement, impeding the traffic flow. Therefore, understanding the traffic flow behavior in the context of on-street parking could be challenging. In this context, the present study explores the influence of on-street parking on the stream speed of regular traffic. To achieve this, data were collected at various ideal and parking sections. The stream speed ranges from 39.28 to 51.47 km/h for ideal sections with significant percentage reduction observed at parking sections, ranging from 39.09-81.30%. This speed reduction was then modelled considering the most significant parking parameters conceptualized in this study. The findings of the study offer valuable insights that can be implemented for developing the on-street parking norms.



A methodology to estimate the stream speed of the parking section is proposed in the present study. The study conceptualizes the most efficient parking parameters influencing the stream speed of the vehicles. These parameters were compatible with the Indian traffic context. Below are the major findings of the study.

- The speed at parking sections was significantly reduced in the presence of on-street parking that highlights the importance of considering parking maneuvers and parking width in data analysis. This decline varies within a wide range of 39.09-81.30 %.
- A speed reduction model was by considering two major parking parameters, which predict the impact of on-street parking on stream speed. Further, the developed model can be a valuable tool for urban planning and designing.
- A favorable agreement (-8.422% error) was established between the speed derived from the data extraction and the speed reduction model, which suggests that the proposed model can

accurately estimate the stream speed at the parking sections with varying intensity of on-street parking.

- The findings provide valuable insights for developing norms regarding on-street parking facilities whether on-street parking can be prohibited or allowed and if it is allowed then up to what extent? The model also reveals how the stream speed of vehicles at parking sections enhances or declines in the presence or absence of on-street parking.
- The proposed model can be helpful for urban transportation planners for easy estimation of stream speed at parking sections saving valuable time in the data extraction process.
- The methodology adopted in this research can be further implemented in future to extend the work and explore the impacts of different parking patterns such as angled or perpendicular on the stream speed. Additionally, this research also provides suggestions to examine the driver's behavior when vehicles are parked in designated bays or on the roadside.

In summary, the present study can be effective for urban transportation planners, while providing parking regulations. The proposed model offers a straightforward approach for estimating the stream speed under varying intensities of on-street parking, providing valuable insights for the traffic management and urban transportation planning efforts. This research contributed to better understanding of on-street parking and stream speed which offers practical solutions to overcome traffic congestion in urban areas.

Future scope of the study

This study opens several avenues for further research to deal with the impacts of on-street parking on stream speed.

- The type of on-street parking, whether unregulated or with designated parking bays, may instigate a considerable difference in the impact of on-street parking on the regular traffic flow. The impact is expected to be reduced in the case of a designated parking bay as

compared to an undesignated parking bay. However, the designated parking bay on a collector type of road is not common in India. Hence, comparing the impacts of unregulated parking with the designated parking bays is beyond the scope of the present study. Nevertheless, this comparison will be interesting to see and can be investigated in future studies.

- The type of on-street parking (parallel, angled or perpendicular) may play a significant role in determining its impact on the stream speed. However, considering the fact that the parallel parking is the most commonly found parking type on Indian urban roads, the same has been adopted in the present study. Nevertheless, comparing the impacts of different parking types can be a meaningful venture and will be taken up in future studies

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CREDITS

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CHAIRMAN 'S MESSAGE

It gives me immense pleasure to introduce our Technical Magazine "BUNIYAAD" from Dept. of Civil Engg. will be published bi- annually. Our students are very innovative and ever eager to learn new concepts. Apart from teaching, our faculty members are deeply engaged in research work. Our faculty and students regularly present their research findings in various academic conferences. It will help the documentation culture of the institute. One of our greatest strength is our highly qualified and dedicated faculty members and staff. I congratulate the editorial team, faculty, staff members and students for their contribution in the maiden issue of "BUNIYAAD". It is an attempt of the Technical Magazine to acquaint its readers with the Technological updation in the field of Civil Engineering.

Mr. Ambika Mishra
Chairman
Ambalika Group of Institutions

DIRECTOR'S MESSAGE

I feel honored and grateful to start the latest edition of our Technical Magazine "BUNIYAAD" from Dept. of Civil Engineering. This magazine will serve to reinforce and allow an increased awareness in the field of Civil Engineering and an improve interaction among all of us. It will not only serve the objective of creating responsiveness but will give a platform to new ideas, progress and creativity. I do hope that it will encourage faculty, students and others to contribute regularly in making our newsletter a success and may it acquire great heights in the years to come.\

Dr. Ashutosh Dwivedi
Director
Ambalika Group of Institutions

ADDITIONAL DIRECTOR'S MESSAGE

I am privileged to introduce the latest edition of our esteemed Technical Magazine, "BUNIYAAD" from the Department of Civil Engineering. This publication stands as a testament to our collective dedication to advancing knowledge and fostering innovation within our field. It aims to not only enhance our understanding of Civil Engineering but also to strengthen the bonds among us as a community.

Through this platform, we aspire to inspire creativity, share pioneering ideas, and showcase progress. I am confident that this magazine will continue to serve as a beacon for excellence, encouraging regular contributions from our faculty, students, and colleagues. Let us work together to ensure its continued success and propel it to even greater heights in the years ahead.

Dr. Shweta Mishra
Additional Director
Ambalika Group of Institutions

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