MARATHA VIDYA PRASARAK SAMAJ'S
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DEPARTMENT OF CIVIL ENGINEERING

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Department Vision:

To be the leading department providing quality education to develop competent Civil Engineers, Entrepreneurs, and innovators to serve the nation.

Department Mission:

M1- To provide quality technical education.

M2- To prepare competent students for employment.

M3–To focus on developing values and professional skills.

Program Educational Objectives:

1. To ensure that graduates will have a mastery of fundamental knowledge, problem solving skills, engineering experimental abilities, and design capabilities necessary for entering civil engineering career and/or graduate school.

2. To incorporate verbal and written communication skills necessary for successful professional practice.

3. Demonstrate knowledge of management principles and engineering techniques for effective project management.

4. To prepare graduates to deal with ethical and professional issues, taking into account the broader societal implications of civil engineer.

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1. Low-cost Housing MIDC Satpur

Mr. Mayuresh Patil TE student, Ms. M. B. Murkute Seminar Guide

This study looks into the workings of private developers and the people residing in Nashik, in the context of affordable housing segment. The research aimed to examine how private developers and people residing deal with their land-related issues when operating within the state's regulatory framework. Policies take a long time to implement and completely incorporate policy making and implementation differ greatly in different components. There was no clarity about the regulatory framework, policies related to affordable housing. Developers should be aware of contingency schemes and cooperative production schemes government venture schemes that seek to address the issue of land availability and land costs. Capitalization of higher FSI for affordable housing is a good way to handle the heavy costs. This study looks into the workings of private developers and the people residing in Nashik, in the context of affordable housing segment. The research aimed to examine how private developers and people residing deal with their land-related issues when operating within the state's regulatory framework. With this study area of NH-848 is a major arterial road that connects Thane-Nashik-Gujarat via. Then it is divided into the 4 types of Zones.1) Canal link Road 2) Ambad, Trimurti Chowk 3) ITI Ambad Road 4) Ambad Satpur Link Road. The study area population is 243,642. All the data of the land rates of each zone is analysed. After it commercial, industrial, and residential sector overview is been carried out. Analysis of the data collected from all the sector is been carried out to provide out strategies.

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2. Traffic Road Congestion Management – A Case Study on Dwarka Circle in Nashik City

Prof. Monika Murkute, BE Project Guide
Atharva Katkade, Kaushal Jadhav, Dipak Patil, Manish Patil (BE Students)

Physical infrastructure is crucial to the prosperity of any country. Nashik's infrastructure has recently experienced a boom thanks to the building of the National Highway, Arterial Roads, and Ring Roads, which have facilitated the city's infrastructure growth. Due to its central location in the middle of Nashik, with access points in all directions, the Dwarka circle can be regarded as the city's "Epicentre". This facilitates transportation to and from Nashik in all directions. The flyover at Dwarka Circle has entry and exit locations, which causes a mixed-traffic situation. There should be separate lanes for each direction. According to the accident analysis, accidents tend to happen more frequently during the day. Mixed traffic, bad road geometry, a lack of traffic sense, breaking traffic laws, weather conditions, driving habits, and irresponsibility on the part of the driver are the causes of accidents. One way or two-way traffic systems should be decided upon in order to decrease the number of accidents. During peak hours, traffic regulation policies should be established. Dwarka Circle, which connects all of the major cities in the Nashik Division, is crucial for the city's connectivity. Hence, it causes the congested traffic near Dwarka junction. Many solutions have been used for years, yet the traffic problem has not changed. The installation of two traffic management systems at a single intersection is one of the causes of traffic congestion. People do not adhere to proper rules and regulations. Due to improper traffic regulation,

data analysis and the completion of productive tasks are becoming necessary. To remove the roundabout and install an appropriate lane system

there, so as to shorten the travelling distance. Implementation of appropriate sign boards to direct traffic in the right way and prevent collisions. To relocate the bus stop from its current location on the road to a wide area nearby and make that present road for Mumbai only. The underpass needs to be properly maintained so that pedestrians can once again use it, by making aesthetic design and develop interest in them. The installation of a monitoring system, along with its integration with the new signal system to refrain from breaking the law. To move the taxi, stand and every other pickup service beneath the down ramp empty area.

3. Factors Leading to Revenue Loss in Case of DBFOT Toll Road Project

Prof. Rohan C. Patil

In the recent years a new concept that has got developed across the world for the development of roads called as Public Private Partnership (PPP) which serves as the model for high efficiency and timely delivery along with reduction on burden on the government. Design Built Finance, Operate and Transfer (DBFOT) one of the forms of PPP in which the private player is responsible for the design, built, finance, operate and transfer of the road project. It has been observed in some cases that, when the project enters its operation and maintenance phase the project is likely to go through revenue loss. There are some specific factors which lead towards the revenue loss.

Today's vision of India is bustling with energy, entrepreneurship and innovation. Many developments took place in modern era of 21st century. Out of those, development in case of roads served for better connectivity to different locations across the nation and transport of men & commodities with ease and speed. Roads proved to be backbone of nation in its overall development. Now a days to overcome the traditional way of constructing roads and to cop up with the modern era of technology to make it easy for government to deal with development in roads a new concept of PPP (Public Private Partnership) has emerged and proved to be beneficial for purposes like 1] Reduce financial burden on government, 2] Complete project on time. 3] Improve service quality and efficiency, 4] Better value for money invested, 5] Transparent process of inviting private participation, 6] Sharing the risk between Government & Contractors. Though PPP has proved to be beneficial but the other side of the coin is that various risks are generated during the life cycle of the PPP project. The DBFOT project undergoes different phases such as 1] Design Phase, 2] Built Phase, 3] Finance Phase, 4] Operation & Maintenance Phase and 5] Transfer Phase. During this operation & maintenance it undergoes some risks out of which the 'revenue risk' proved to be vital one. The risks generated have an origin. The factors contributing to the revenue loss in case of DBFOT toll road projects are A] Biased Nature of Project, B] Unacceptability of High Toll Rates (in comparison to benefits), C] Faulty Project Structuring (wrong positioning of toll plaza), D] Politically Motivated Resistance, E] Government's Inaction due to Political/Social Reasons, F] Additional Concessions /Passes, G] Lack of Support from Government Officials, H] Inadequate Government Support for the Toll Enforcement. These factors identified are required to mitigate immediately or the project would lead to termination of agreement

between the parties.

4. Dam Breach Analysis of Earthen Dam

Prof. Rohan C. Patil

The growth of civilization is inextricably woven around the availability of water the world over. Dams are human device for exploitation of water for irrigation, flood control and hydro-power development etc, and thus occupy a pivotal role in the development activities of the human race. Dams, however, are not unmixed blessings. They do pose a major hazard in the unlikely event of a failure. There have been about 200 notable reservoir failures in 20th century in the world so far. It is estimated that more than 8000 people lost their lives in these disasters.

Dams are considered "Installations contain dangerous forces" under International humanitarian law due to the massive impact of a possible destruction on the civilian population and the environment. Dam failures are comparatively rare, but can cause immense damage and loss of life when they occur. In 1975 the failure of the Banqiao Reservoir Dam and other dams in Henan Province, China caused more casualties than any other dam failure in history. The disaster killed an estimated 1,71,000 people and 11 million people lost their homes.

Realizing the importance of dam safety, many countries in the world have initiated action to review the safety of dams in their countries and United States of America can be considered a pioneer in this field. The review conducted recently by US Army Corps of Engineers revealed that out of 8819 review inspection completed, 2925 dams were evaluated as unsafe. Of the various causes, inadequate spillway capacity was the primary deficiency found in 81% of the unsafe dams. Keeping in view the importance of the dam safety in our country, a dam safety organization was established in May 1979 in Central Water Commission to assist the state governments in various activities in dam safety. The dam safety organization also initiated action for reviewing the existing procedures of dam safety in the country and also evolves appropriate dam safety practices. [CWC- Dam Safety Organization]

Dam break study depends on two primary tasks: estimating the breach flood hydrograph and routing this hydrograph downstream of dam site. Essentially the breach flood hydrograph depends on the prediction of breach geometry and breach formation time. Breach parameter prediction comprises the highest uncertainty of estimating dam break flood. Empirical approaches used to predict breach parameters rely on data obtained from historical dam failures. Many dam break simulation models require the user to estimate the breach dimensions individually and provide this information as input to the simulation model. Dam breach parameters can be obtained from widely used empirical approaches. These methods are based on statistical analysis of data derived from documented dam failures, which give reasonable predicted values compared to actual observed values.

5. Stabilization of Soil Using Plastic Waste

Gawali T. R.[1], Waklekar T. S.[1], Ugale S. R.[1], Shelar C. S.[1] Dr. Kadbhane S.J.[2]
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Today, plastic trash has escalated into a significant global issue. Plastic trash is an extremely complicated issue that affects the entire nation. Everyone is currently dealing with the dreadful pollution known as plastic pollution. The biggest environmental problem India is currently experiencing is plastic trash. Currently, 56 lakh tons of garbage are produced annually, which is 9205 tons of plastic each day. Plastic garbage is affecting our environment everywhere, whether it be in the oceans, rivers, mountains, or barren plains. It is incredible to think that plastic, which was first created by humans in the past as a convenience, has over time turned into a catastrophe for the ecosystem. Despite the prohibition on plastic bags, today. It is evident that these guidelines

The use of plastic has to be limited now otherwise there would be harsh circumstance that human and the environment has to face in the near future. Since Plastic is non-decomposable material, the necessity for recycling or reusing it is also increasing, reducing its wastage. Utilizing this Plastic waste for a positive purpose also reduces its effect on the environment.

The main motive of this research is to evaluate the effect of incorporating waste plastic bottles on the geotechnical properties of soil. Various percentages of waste plastic bottles (0%, 0.5%, 1.0%, 1.5%, and 2.0%) were added to the soil sample and sequel the engineering properties of soil. For this, various laboratory tests were conducted on soil samples like moisture content, California Bearing Ratio, Proctor Test, Direct shear test, etc., and compared with the soil samples without any plastic waste.

From this study, it is evaluated that addition of the waste plastic in the soil shows a positive effect on soil stabilization. It promotes the re-use of waste plastic from industry in an economical and environmentally friendly way and will also help with the disposal problem of these plastic wastes to some extent.

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6. Effect of Graphene Oxide on Properties of Cement Mortar and Its Strengthening Mechanism

Vedant Mogal, Shrikant Kochure- BE Civil

Graphene oxide (GO) has emerged as a revolutionary nanomaterial in the construction industry due to its excellent mechanical, chemical, and thermal properties. When incorporated into cement mortar, graphene oxide significantly enhances its strength, durability, and overall performance. The addition of GO improves the microstructure of cement-based materials, leading to increased compressive and flexural strength, reduced permeability, and enhanced resistance to cracking.

Compressive and Flexural Strength: The presence of graphene oxide in cement mortar increases both early and long-term strength. GO particles act as nucleation sites for cement hydration products, leading to a denser microstructure and better bonding within the matrix.

Workability and Rheology: Depending on the dosage, GO can improve the workability of cement mortar due to its ability to disperse evenly and prevent the agglomeration of cement particles. However, excessive GO may reduce fluidity due to its high surface area and water absorption capacity.

Durability Enhancement: GO enhances durability by reducing porosity and refining the pore structure of the mortar, making it more resistant to water ingress, chemical attacks, and freeze-thaw cycles.

Crack Resistance and Toughness: The high tensile strength and flexibility of GO contribute to increased fracture toughness by controlling crack propagation and bridging microcracks, leading to improved long-term structural integrity.

Strengthening Mechanism of Graphene Oxide in Cement Mortar

Nucleation Effect: GO provides nucleation sites for the formation of calcium silicate hydrate (C-S-H) gel, accelerating the hydration process and leading to a stronger cement matrix.

Pore Structure Refinement: The dispersion of GO within the cement paste helps in reducing pore size and distribution, minimizing voids and enhancing overall density.

C-S-H Interaction: GO sheets chemically interact with C-S-H gel, forming stronger interfacial bonding that improves load transfer and resistance to microstructural degradation.

Crack Bridging and Toughening: Due to its nanoscale dimensions and high tensile strength, GO acts as a reinforcement agent, bridging microcracks and delaying their propagation, thereby increasing the toughness and ductility of the mortar.

Conclusion

The incorporation of graphene oxide into cement mortar presents a promising approach to enhancing mechanical and durability properties. Its strengthening mechanism, based on microstructure refinement, improved hydration, and crack resistance, makes it a valuable additive for high-performance and sustainable construction materials. Further research and optimization of GO dosage and dispersion techniques can lead to more efficient applications in concrete technology, paving the way for the next generation of advanced building materials.

7. Bendable Concrete: A Revolution in Construction

Abhishek Tankar, Vishal Patil- BE Civil

Bendable concrete, also known as Engineered Cementitious Composite (ECC), is an innovative material that addresses the limitations of conventional concrete, offering enhanced flexibility, durability, and crack resistance. Traditional concrete is brittle and prone to developing cracks under tensile stress, which can lead to costly repairs and structural failure over time. In contrast, ECC incorporates specially engineered polyvinyl alcohol (PVA) fibers and other additives

that enable it to undergo significant deformation while maintaining its structural integrity. This ductility makes it 300–500 times more flexible than ordinary concrete, allowing it to bend under pressure rather than breaking.

One of the most remarkable features of bendable concrete is its self-healing capability. The presence of fine cracks instead of large fractures ensures that, when exposed to moisture and carbon dioxide, calcium carbonate forms within these cracks, effectively sealing them over time. This property significantly reduces the need for maintenance and extends the lifespan of structures. Due to its superior crack resistance, ECC is widely used in critical infrastructure such as earthquake-resistant buildings, bridges, pavements, tunnels, and high-impact zones where conventional concrete would fail.

Moreover, bendable concrete eliminates the need for coarse aggregates, making it a more sustainable construction material. By reducing the use of natural resources and minimizing the carbon footprint associated with concrete production, ECC contributes to environmentally friendly construction practices. Although it is currently more expensive than traditional concrete due to its specialized composition, its long-term benefits in terms of durability, reduced repair costs, and enhanced safety outweigh the initial investment. With ongoing research and development, ECC is expected to become more cost-effective and widely adopted in future infrastructure projects, revolutionizing the way we build resilient and sustainable structures.

8. Use of Python in Construction Management

Shweta Ingale, Sakshi Salve- BE Civil

Python is revolutionizing construction management by providing powerful tools for data analysis, automation, and project optimization. With its simplicity and versatility, Python helps in scheduling, budgeting, risk assessment, and resource allocation, making project execution more efficient. It enables automation of repetitive tasks such as report generation, document management, and progress tracking using libraries like **Pandas**, **NumPy**, and **OpenPyXL**.

Python is also widely used in **Building Information Modeling (BIM)** and **structural analysis**, where libraries such as **Dynamo for Revit** and **CAD scripting tools** help in modeling and simulating complex structures. Additionally, Python-based **machine learning algorithms** assist in predicting project delays, optimizing material usage, and improving site safety.

In project scheduling, Python integrates with tools like **Primavera P6** and **Microsoft Project** to automate schedule updates and critical path analysis. GIS and remote sensing applications in construction also leverage Python for analyzing spatial data, monitoring construction sites, and optimizing logistics.

Furthermore, Python plays a crucial role in **IoT-based smart construction** by processing real-time sensor data for tracking equipment usage, environmental monitoring, and predictive maintenance. With the rise of digital transformation in the construction industry, Python continues to enhance decision-making, reduce costs, and improve overall project efficiency, making it an essential tool for modern construction management.

9. U-Loop Traffic Design

Yash Junagade, Shubham Sonawane- BE Civil

The **U-Loop traffic design** is an innovative and efficient road infrastructure concept aimed at reducing congestion, improving traffic flow, and enhancing road safety at intersections and highway crossings. In conventional traffic systems, direct right or U-turns at intersections often lead to bottlenecks, increasing delays and the risk of accidents due to sudden stops and lane changes. The U-loop design strategically diverts turning vehicles into a separate loop, allowing them to merge back into the main road smoothly without disrupting the flow of straight-moving traffic. This approach not only minimizes waiting time at traffic signals but also significantly improves the overall efficiency of road networks.

One of the key advantages of U-loop traffic design is its ability to **enhance road safety** by reducing conflict points at intersections. Traditional intersections are hotspots for accidents, particularly where vehicles make right turns across lanes of oncoming traffic. The U-loop eliminates this hazardous maneuver, instead guiding vehicles through a designated turning loop that merges them back onto the main road safely. This reduces the likelihood of collisions, particularly those involving high-speed traffic on highways. Moreover, by **improving traffic signal efficiency**, U-loops help in minimizing stoppages, allowing a smoother and more predictable traffic movement pattern.

Additionally, the U-loop design offers a **cost-effective alternative to flyovers and underpasses**. While infrastructure projects such as bridges and tunnels require significant investments in construction and land acquisition, U-loops can often be implemented within the existing road layout, making them a more affordable solution for traffic management in both urban and suburban areas. This is particularly beneficial for developing cities where budget constraints limit large-scale infrastructure expansion. Another advantage is its contribution to **environmental sustainability**—by reducing vehicle idling and unnecessary stopping at signals, U-loops help in lowering fuel consumption and carbon emissions, making them an eco-friendly solution to urban mobility challenges.

The application of U-loop design is widespread across **highways, urban road networks, and Bus Rapid Transit (BRT) corridors**. In highway intersections, it allows seamless U-turns without interrupting high-speed traffic, while in cities, it optimizes intersection performance, reducing congestion during peak hours. Public transport systems also benefit from U-loops, as they ensure smoother and safer bus movements, enhancing the efficiency of BRT corridors. Given its numerous advantages, **the U-loop traffic design is emerging as a crucial element in modern urban planning**, helping cities build smarter, safer, and more efficient road networks.

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10. Treatment of Wastewater and Generation of Electricity Using MFC Technology with the Wetland Process

Pitlewar Parithoshika, Vaibhav Sanap- BE Civil

The treatment of wastewater and simultaneous generation of electricity using **Microbial Fuel Cell (MFC) technology** integrated with the **wetland process** is an innovative and sustainable approach to environmental management. Traditional wastewater treatment methods consume significant energy, whereas MFC technology offers a solution that not only treats wastewater but also **generates bioelectricity** through microbial activity. When combined with

constructed wetlands, this system enhances pollutant removal while providing an eco-friendly energy source, making it an ideal solution for decentralized wastewater treatment facilities, especially in rural and peri-urban areas.

Microbial Fuel Cells (MFCs) utilize electrochemically active bacteria that break down organic pollutants present in wastewater. These bacteria generate electrons as part of their metabolic process, which are then captured by an anode and transferred to a cathode via an external circuit, producing an electric current. This process effectively degrades organic matter, reducing **Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and nutrient loads**, while simultaneously harnessing energy that can be used to power small electrical devices or sensors for real-time monitoring of water quality.

When **MFC technology is integrated with the wetland process**, it significantly enhances the efficiency of wastewater treatment. **Constructed wetlands**, which consist of natural or artificial basins filled with vegetation, act as biofilters to remove contaminants through processes such as **filtration, sedimentation, microbial action, and plant uptake**. The presence of wetland vegetation improves oxygen transfer, further promoting bacterial activity within the MFC system, which boosts both **electricity generation and pollutant removal efficiency**. This hybrid system can treat **municipal, industrial, and agricultural wastewater** with minimal energy input and maintenance, making it a sustainable alternative to conventional treatment plants.

The key **advantages** of this technology include:

1. **Sustainable Wastewater Treatment** – It effectively removes organic and inorganic pollutants without relying on external power sources.
2. **Renewable Energy Generation** – The electricity produced can be utilized for low-power applications such as sensors, streetlights, or remote monitoring systems.
3. **Low Operational Costs** – MFC-wetland systems require minimal maintenance compared to energy-intensive treatment plants.
4. **Environmental Benefits** – It reduces greenhouse gas emissions, promotes biodiversity in wetlands, and supports natural ecosystem functions.
5. **Scalability and Adaptability** – Suitable for decentralized applications, especially in areas lacking conventional wastewater treatment infrastructure.

Recent advancements in MFC research focus on improving **electrode materials, optimizing microbial communities, and enhancing system scalability** to increase energy output. Future developments may see the integration of **nanotechnology, advanced bioelectrodes, and artificial intelligence-based monitoring systems** to maximize efficiency. Given the growing demand for **sustainable wastewater treatment and renewable energy**, the **MFC-wetland hybrid system** presents a promising solution for tackling water pollution while harnessing clean energy.

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