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Design of Two-Wheeler Parking System

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Abstract : *The population of the world is continuously on the increase and towns and cities have grown up around their public transport system. In order to reduce the stress of parking. owners, adequate parking facilities must be provided to meet up for the demand of parking This research present the design of a multi-level car park for the mitigation of traffic challenges in public areas using various case studies. Our building design consists of G+3 floor. All floors are designed to accommodate 45 cars. The plan for this building was prepared using AutoCAD software. The analysis of the frame was carried out for vertical and horizontal loads using STAAD Pro software. The design has been done according to the Limit state method and confirming to Indian standard code IS 456-2000 for various structural and non-structural components. Further reinforcement detailing for various structural elements being made as per SP-16. The structural elements like shab, beam, columns, footing and staircase has been designed and detailing was incorporated by designing these structural elements it helps us to gain more amount knowledge and gives an experience for our future*

Keywords – *two- wheeler parking system near Virar railway station*

I. INTRODUCTION

1.1 GENERAL

Projects for smart cities are currently receiving a lot of attention. The lower stories with the greatest earning potential can be preserved as commercial space while the higher floors can be used for dwelling purposes, according to a revolutionary approach of successfully utilizing a building's vertical restrictions for this purpose.

1.2 OVERVIEW OF THE PROJECT

The goal of this project is to create a thorough plan for multi-level car parking with parking areas on each story (G+3). The Parking system has a total size of 600 square meters. All of the essential features for a Car Parking Facility have been provided. STAAD PRO was used to design all components such as Slab, Beams, Columns, and Footing. The staircase has been installed to enable access to each story. The design was created using the Limit state method and in compliance with Indian standard coding principles.

1.3 PROFILE OF STUDY AREA

Several suburban stations were evaluated in order to identify a specific site that suffers from significant traffic congestion and parking challenges, particularly for two-wheelers. Following Vasai, Virar, Mira Road, Thane, Bhayander, Kandivali, and many other locations were visited to determine which location is best suited for parking development. Following that, the Virar station was chosen as the location for parking development. shows that plot area of the site for which the survey is conducted. It has an area of **1000 sq.m**

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FIG:1 SATELLITE VIEW OF THE SITE (VIRAR RAILWAY STATION)

The investigation was conducted at the Virar Railway Station parking lot and within a 1000 square meter radius of the parking lot. According to parking surveys, Virar railway station is a busy stop on the Mumbai suburban railway's western line. One of the oldest bus depots is located in Virar West (purshottam parekh marg road). Western Express is on the right-hand side and is connected by a main road. It is also connected by a flyover that is located 3 to 4 kilometers ahead of the purshottam parek marg road. Near this road is (sai pay and park), where we are constructing a G+3 rcc structure; this pay and park is located in the heart of the bus depot and railway station. This pay and park is linked to appropriate routes such as Chhatrapati Shivaji Marg, Gaothan Road, Mhatre Wadi Road, and Padma Colony Road.

1.4 SURVEY PROCEDURE

The survey was divided into two stages: site reconnaissance and actual survey. Under Site Reconnaissance Survey, the current scenario of the site was observed, and the capacity of the site was documented, as well as overcrowding of vehicles without parking and attempts to find a solution for parking the maximum number of vehicles. The site was also surveyed over a radius of 250m. It was discovered that some of the different lanes of traffic arriving at the site Parking lanes were full, causing congestion in the road system, and this problem is readily rectified by providing parking space. The lanes were then joined into various combinations such as 1-7a, 2-8, and so on to meet survey requirements.

The real poll was conducted by police through a parking usage survey. The real survey parking area count, lanes count, and classified cars count were successfully done by a group of four viva institute of technology students (virar-east shirgaon). According to the guidelines, the survey lasted 4-5 hours, including peak hours. The survey was conducted at noon that was not affected by any public holidays or other reasons. Dated October 29, 2022, from 7 a.m. until 10 a.m.The time was chosen. and record with suitable data which vehicles were parked on and off the street. The license plate number was recorded. After scanning each lane, we took a circuit of the whole lane, recording each 2-wheeler vehicle parked in the lane. Following that, we take readings to determine whether or not a specific vehicle is present at the same spot. Finding certain automobiles parked for a number of hours in a specific lane.

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II LITERATURE REVIEW

1. **Motorcycle Parking Design with Simulation Approach Case Study: Rusunawa Penjaringan Sari 3, Surabaya:** This five-story building can house 99 people. The majority of the tenants use motorcycles to get around, and each unit may have more than one. The total number of motorbike inhabitants recorded through observation and interview at each unit is 145, and they are divided into two parking spaces. The first parking area is located below the building and is 20 m × 4.8 m, with a capacity of 58 motorcycles, while the second parking area is located outside the building and measures 15.45 m x 5.80 m, with a capacity of 42 motorcycles. Due to the limited capacity of certain parking areas (100 motorcycles), 45 motorcycles must park in parallel or in forbidden parking areas.

2. **Design of Multilevel Independent Parking System for Two Wheelers**
After going through a survey in city like Pune and Looking at present scenario, we have come to conclusion that there is tremendous increase in the number of two wheelers in places like theaters, malls, hospital etc. So, there is intense need of parking system in those places for eradicating parking problems. Therefore, we have decided to design and Develop a two-wheeler parking system. In this city, we have many multilevel parking systems but they all are dependent as we have survey but we want that the system should we independent to access for saving time. Now, we are facing the parking problem for four-wheeler parking system by looking at these we will face problem for two-wheeler parking system in coming decades

3. **Study of parking system near Surat railway Station road And Resolving the Demanded gap**
Today's two-wheeler population is growing. People prefer to ride two-wheelers to neighbouring destinations such as theatres, hospitals, colleges, and schools. As a result, the intensity of providing parking for two-wheelers in all of those locations becomes a challenge. The current project attempted to create a two-wheeler parking system that could accommodate two to four two-wheelers within a 4m2 parking area. Despite the fact that many different types of parking systems have been established, this study focuses on designing a simple and compact parking system with a small footprint and a low cost. During the investigation, we did our best to design and build a little two-wheeler parking system out of a chain block. This project is about a parking system with a lift. This project is about a two-wheeler parking system with a lift. We concentrate on dispersing parking spaces and offering adequate parking facilities. We are interested in ways to increase parking space and parking facilities.

4. **Concept design and proto build of Roto parker for two-wheeler: Prashant Kumar T J, Dr H Vitali. And Praveen,M. Tech in PDM**
Vehicle parking has become a serious challenge in all crowded locations of urban cities. As a result, a parking system that can park a greater number of vehicles in a limited or available space is required. The necessity for parking space grows in tandem with the continuous increase in the number of two-wheelers. If a multilevel parking system is developed, the parking space can be used to its full potential. There are multilevel parking systems for cars, such as puzzle parking, tower parking, multi-circulation parking, and rotary parking. Our proposal is about a rotational parking system for a two-wheeler. The current project work is to create a two-wheeler parking system that can accommodate 20 two-wheelers**.** A parking spot of 30m2. The parking platform can be driven by the chain and sprocket system, and a suitably powered brake motor is utilized to power and index the platform. A platform assembly prototype is built to fit the functioning model. This concept is also useful in other disciplines of engineering for developing various types of automation microcontrollers and computerization, among other things.

5. **Analysis & Planning of 2-Wheeler Parking Facility near Railway Station**
Kushal Panchal, Piyush Parmar, Sushil Yadav
In the last two decades, the annual urban population growth rate has been greater than 1%. The urban population is larger, with 41% residing in metropolitan urban regions. In metropolitan urban regions decades ago, the rate of bikes was as high as 75%; on average, bike deals increased by 9% in April-walk 2015 over April-walk 2014.Bike sales increased by 25.06 percent, 2.50 percent, and 4.51 percent, respectively, in April-walk 2015 compared to April-walk 2014. Overall, a vehicle stops for 8360 hours out of 8760 hours every year (5% of the time in a day).

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III METHODOLOGY

3.1 ANALYSIS METHOD:

A building may be a load-bearing, framed, or combination structure. Nowadays, framed structures are more commonly used. Beyond this, framed constructions are favoured because they are more durable and have improved strength In reinforced concrete buildings, columns, beams, and substructures are continuously arranged to create a rigid framework. Greater redundancy, fewer moments, and more even load distribution are all benefits of this continuous system. The effects of horizontal loads, such as wind and earthquakes, are dispersed over the entire structure, significantly enhancing its safety. The floor is supported by beams, which may be supported directly by columns or by beams that are first supported by columns

3.1.1 STRENGTH The dead loads of the structure, live loads, and horizontal loads all impose stresses on each part of the structure that must be safely absorbed by the structure as a whole

3.1.2 STABILITY The elements of the structure and its parts should be safe from overturning, sliding or buckling under the action of the loads

3.1.3 SERVICEABILITY The building should function properly under service load conditions, i.e., it should be able to fulfil its intended function during its service life. The structure is deemed to have failed if it is unable to accomplish any (or all) of the aforementioned goals. Designers take into account two extra aspects in addition to the three aforementioned aims. Economy and aesthetics are them. By economy, we mean that the price of the structure must reflect the value of the services it offers. One can always construct a large building that is more than strong, stable, and serviceable, but the cost of the structure may be too high and the finished product may not look good.

3.2 STRUCTURAL SYSTEMS:

A system of connecting components in a building's construction transfers the loads to the ground. While the majority of building frames are made to support vertical loads, some frames are better suited to support horizontal loads. A structural system can be classified as a load-bearing wall system or a building with flexural wall system. a system of frames that resist moments Floral wall dual frame system tube and space frame system.

3.2.1 WALL SYSTEM FOR BEARING LOAD No columns are supplied in this kind of building. In addition to provide resistance to lateral loads, the walls support all gravity loads.By using non-bearing flexural walls of braced frames, lateral loads are supported. Although providing lateral resistance in the vertical load resistance frames is not required, it is highly advised that notional moment resistances be included in the design of the vertical load frame.

3.2.2 MOMENT RESISTING FRAME SYSTEM It is a system in which parts and joints can primarily flex to resist vertical and lateral forces. The frame must be described in accordance with IS: 13920-1993 to ensure ductility, with the exception of seismic zone II, in order to be eligible for a response reduction factor R-5. The relative stiffness of girders and cohms is crucial in a moment resistance frame. Strong column-weak girder proportions or weak column-weak girder proportions can be used to construct a frame.

3.2.3 FLEXURAL (SHEAR) WALL SYSTEM It is an IS 13920-1993-compliant reinforced concrete wall that is detailed to give ductility and is built to withstand actual forces parallel to the wall's plinth. it is only permitted to use these systems up to a height of 70 meters if and only if they can withstand no more than 33% of the earthquake design force, including torsion effects. It is important to make sure that each of these four or more flexural walks is in a different plane and sufficiently spread throughout the design or along the building's perimeter so that the premature failure of a single wall or frame wouldn't cause significant linguistic torsion.

3.3 LOADS:

The building is subjected to the following load during its service life.

3.3.1 DEAD LOADS The weight of all the walls, partition walls, floors, and roofs, as well as the weights of all the other permanent constructions in the building, shall be included in the building's dead load.

3.3.2 LIVE LOAD Live loads, also known as superimposed loads, are all moving or fluctuating loads brought on by humans, machines, and other moving objects. All loads other than the dead loads are considered to be live loads on floors. In IS 875: 1987, the various live loads impacting various floors are listed.

3.4 IDEAS FOR DESIGN:

For the construction of reinforced concrete structures, three design philosophies are employed, including the working stress technique. Maximum load and maximum state methods. Currently, the limit state method of design is advised by IS 456. It did, however, keep the working stress technique of design.

3.4.1 ULTIMATE LOAD METHOD This method incorporates concrete's non-linear behavior and makes use of a poor factor to raise operating kad and get maximum loads. Structure is made to withstand ultimate loads' want. Based on the supposition that concrete has an ultimate strain of 0.3% and that the compressive stress at the extreme fiber of the section corresponds to this strain, Whitey's ultimate theory was developed.

IV CONCLUSION

- The multi-level car parking was designed as a G+3 building
- The layout of the building was planned with reference to Codes to facilitate maximum utility.
- Columns were designed according to axial, uniaxial, and biaxial loading conditions and footings were provided based on column design.
- For emergency purposes separate dog-legged staircase provide on the front side of the structure. Estimation was done and the approximate cost for the construction of car parking was calculated
- .The project has helped us gain a fair amount of knowledge on Structural Analysis and Design of reinforced concrete and had an experience with STADD PRO & Revit Architecture software.
- Based on the investigation, it was determined that there is a significant need for parking near this station and that a multilevel parking solution is required.
- Depending on the increase in vehicular demand and population, a multi-story parking lot with a capacity of at least 1000 bikes is proposed.
- The project's cost will also be estimated, which will assist the government in determining whether or not to engage in this public assistance initiative.
- The money invested can be repaid by charging the car owner for timed parking.

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