DESIGN AND ANALYSIS OF MULTISTOREY PARKING

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ABSTRACT

This project is aimed to design an efficient parking system and helps to minimize the parking area in the city. In the modern world where the parking space has become a major concern, in our city. The VISAKHAPATNAM city is recommended for smart city, which includes all the facilities like tourism, commercial complexes, institutions etc.

The traffic scenario is changing from day to day. All these facilities leads to the traffic congestion and efficient need for parking. To avoid this problem we suggest the design of “Multistory parking” at Dandubazar market near Jagadamba center, which might be a shopping hub in future. To control parking problems we suggest multi story parking system in this place. This multi storey parking enables the parking of vehicles, floor after floor and thus reducing the wastage of space. Here, we provided parking for more than 277 cars according to design. In order to determine the requirements of such parking system, we designed the building for G+3 floors.

The design is done based on the requirements, terms and conditions. The design of multi-story parking system is done by using code IS456-2000, CIVIL software’s like AUTOCAD, STAAD Pro etc. The design is checked with manual calculations also. Finally the analysis of evaluation and conclusion is presented with a set of recommendations for the project that might be taken in the future.

INTRODUCTION

With the growing population in Vizag coupled with the high rural to urban migration, facilities, and parking space within the city are inadequate. Using land as open ground parking doesn't fully utilize the land. Multi-storey car parks are common in highly populated cities and town centers. These car parks may be underground or above ground. Sitting these car parks above ground economizes the cost of the structure and takes advantage of natural ventilation. The challenge with above ground multi-storey car parks in a scenic environment is how to blend the car park with the environment.

Multi-storey car parking is becoming increasing popular as they enable to conserve space. The vehicle is moved from one floor to another floor by using ramps.

The provision of parking is a significant element of transport policy since its presence or absence has a major influence on the choice of transport mode. It can be argued that all parking is related to development; indeed local authorities use parking policy to influence the demand for travel by private car within their areas. Such policies
cover both parking provided by local government or the private sector and parking provided specifically in association with new development or redevelopment proposals.

In urban areas particularly, but also in suburban areas, the growing commercialization of available land has produced rapid and large increase in land values, to the extent that the use of large areas of land for parking automobiles and other vehicles is uneconomical. Unfortunately, the very commercialization which enhances the land values creates an increased demand for vehicle parking space. It is obvious therefore, that optimum economic use of the land can only be achieved through the use of multi-storey car parking garages.

PROBLEM STATEMENT

As the country is developing day by day, it leads to luxury lifestyle. The mindset of the people also changes, this increases the automobile usage. The number of vehicles is increasing every year; it leads to parking problem in every place. The parking slots are half compared to the total number of vehicles. Thus parking slots are needed at every place for vehicular safety.

OBJECTIVES

- The objective of this project is to effectively manage space by the design of a multi-level car parking decks to curb automobiles.
- To identify one of the major problem in our city and to give a technical solution.
- To give a technical solution for the traffic congestion problem at jagadamba center by giving proper plan and design of multi storey parking.

LITERATURE REVIEW

Radhika A. Dahane

She Worked on Multi storey car parks have a number of unique features that distinguish them from other buildings or structures. Multi storey car park is used virtually in every advanced nation. It is called parking structure and is used in the United States especially when it is necessary to distinguish the structure from the garage in a house. Architects and civil engineers usually call it a parking structure due to the nature of their work.

In structural design, a building that is at least three storeys in height must be framed. The loads from the occupants are transmitted through the slab, beam and column and to the foundation and therefore each element of the frame must be designed to effectively handle its own dead load and the load being transferred to it. The structure should be so designed that adequate means exist to transmit the design ultimate load, wind and imposed loads safely from the highest supported level to the foundations. As the height of a building becomes much, horizontal deflections must be computed with greater accuracy. The deflected shapes of individual structural members should be taken into account in the final analysis of tall slender structures.

Abstract: Problems of parking space in urban towns and in all places of large congregation is becoming a common issue around the world. Over the years engineers and architects have come up with a lot of solutions finding a way to create more parking spaces within minimum size of land by the design and construction of multi storey car parks. This is line with the trend in modern cities all over the world of developing high rise buildings as to overcome the challenges of urban over population, for optimal use of scarce land resources, as status symbol, etc. Standing on the advances made so far and the frequent problematic verified on existing Multi storey car parks, this research present the design of a multi storey car park for the
Mitigation of traffic challenges in public areas using various case studies.

Parking Management System:

PVG’s College of Engineering & Technology, Pune, India (S. B. Baglane, M. S. Kulkarni, S. S. Raut, T. S. Khatavkar) students proposed parking system would save time and provide comfortable hassle free parking experience to the users. Features of the parking management system are as listed below:

- Monitoring of parking space and updated indication of vacant parking slots.
- Assistance to the parking place via displays.
- Safe parking assistance using ultrasonic sensors.
- Concept of Green Communication (for energy conservation) i.e. need based ON/OFF facility of parking floor light
- Entry-exit log book

Abstract: The main objective of this project is to avoid the congestion in the car parking area by implementing a parking management system. Normally at public places such as multiplex theaters, market areas, hospitals, function halls, offices and shopping malls, one experiences the discomfort in looking out for a vacant parking slot, though it’s a paid facility with an attendant/security guard. The parking management system is proposed to demonstrate hassle free parking for 32 cars, with 16 slots on each of the two floors.

The proposed system uses 32 infrared transmitter receiver pairs that remotely communicate the status of parking occupancy to the microcontroller system and displays the vacant slots on the display at the entrance of the parking so that the user gets to know the availability/unavailability of parking space prior to his/her entry into the parking place. In this system the users are guided to the vacant slot for parking using Bi colored LEDs and the ultrasonic sensors enable the drivers to park the vehicle safely.

The parking charges are automatically deducted from the user’s account using RFID technology. From security point of view a daily log book of entry/exit along with the vehicle details is also registered in the computer’s memory. Implementation of concept of green communication and exception handling facility make the system concept unique and innovative.

PROJECT METHODOLOGY

Vizag is one of the most rapidly urbanizing cities. Enormous growth in business opportunities, as well as rising urban populations and incomes has led to strong demand for better infrastructure and services. From a sleepy town just about a decade ago, when pedestrians were the kings of the roads, today vizag has metamorphosed into a bustling city packed with killer roads that are chock-a-block with buses, cars, bikes and autos with hardly any room for pedestrians.

- GVMC has a population of 18.15 lakh as per 2011 census.
- Staggering decadal growth of 75% observed between 1991-2001.
- By 2021, Vizag will be a major city in the country.
- The urban agglomeration will grow to 35 lakh.
SCOPE OF THE PROJECT

The scope of this project shall be restricted to space planning and management in the design of a multi-storey car complex. As a multi-storey complex, it will serve as a commercial building as well as a car parking avenue.

NEED FOR MULTI LEVEL PARKING FACILITIES

The existing road network in VISAKHAPATNAM can accommodate only in tens number vehicles whereas there were hundreds in number vehicles in the place. Though there are parking lots available in this place, the capacity of the parking lot is not sufficient to cater to the present demand and at the same time the location of the parking lot is questionable.

In the absence of adequate parking facilities, the vehicles are parked on the side of the street leading to a major bottleneck in the smooth flow of traffic. In addition, high population density, large number of pavement hawkers, sidewalk encroachments, heterogeneous nature of traffic and commercial area development along all the major roads have compounded the problem of congestion on the main as well as internal roads of this place.

Since there is no planned parking space available within this place, currently, the ULB (Urban Local Bodies) and the city traffic police allow parking of passenger vehicles on the side of the road thereby eating away a sizeable portion of motor able road.

The precious time of citizens is wasted due to traffic jams and if this problem is not solved at this stage, and then it would become a serious and complicated problem in future. Multi-level parking lots at strategic places and a rational parking fee are inevitable for solving the problem of finding parking space for the growing number of vehicle.

THE MULTI STOREY CAR PARK

“A multi storey car park is a building (or part thereof) which is designed specifically to be for automobile parking and where there are a number of floors or levels on which parking takes place.

The multi storey car park is a feature that had already come into existence even before World War II, but was not so commonly used. The earliest known multi storey car park was built in 1918. It was built for the Hotel La Salle in Chicago, IL at 215 West Washington Street in the West Loop area of downtown. It was designed by Holabird and Roche. The Hotel La
Salle was demolished in 1976, but the parking structure remained because it had been designated as preliminary landmark status. The Hotel LaSalle multi storey was demolished in 2005 after failing to receive landmark status from the city of Chicago. Jupiter Realty Corp. of Chicago is constructing a 49 storey apartment tower in its place, with construction to begin in September 2007.

DESCRIPTION OF THE STRUCTURE

This structure consists of four floors, having the roof top as open parking. Each floor of the multi storey car park is designed to accommodate about 55 cars parked conveniently. At each corner of the floor lift is provided for people. The ramps are provided for the movement of vehicles from one floor to another floor.

The vertical movement of cars between floors is possible by either of the following means

Interior ramps: the most common type

Exterior ramps: which may take the form of a circular ramp.

Ventilation techniques

The building is designed to have maximum natural ventilation as is required to remove all exhaust fumes from the vehicles. This is achieved by having the exterior walls 0.8m high all through the building with hand rails.

ANALYSIS

The chosen ramp method is dependent on the nature of traffic accommodated by the multi storey car park. A field survey identifies two types of vehicular traffic constituent on jagadamba environment, the short stay and the long stay traffic.

The long stay traffic consists mainly of the workers within the office spaces of the high rise building along the jagadamba. This traffic is the largest and begins arrival from 9:30 A.M till about 10pm. These users park their car hurriedly in any available stall and rush to start their working and shopping, which is the general closing time of shops and hospitals. The shortage of parking slots is arrived in festival season. The users are rushed on peak hour to park their vehicle in safety place

PARKING LAYOUT DIMENSIONS

The minimum acceptable plot size for the multi storey parking is 25 square meters to allow for the structure and an economical ailed layout. The activities that require space utilization in these areas include the following:

- The parking stalls
- Circulation paths (vehicular and pedestrian)
- The ramp (to ascend or descend)
- Conveniences

The Parking Places (Provision of Parking Places and Parking Spaces) Rules stipulate the minimum parking layout dimensions for cars, heavy vehicles and motorcycles parking places. When designing a parking place we must ensure that all the dimensions are met. Where necessary, provision in excess of the requirement should be made to meet the actual demand of the development.

Columns, ducts, services and other items that would affect the standard parking dimensions must be clearly indicated on the plans. These items, in a completed/constructed parking place, must not hinder the minimum dimensions specified in the Rules.

CAR PARKING PLACES
Minimum dimensions of parking stalls:

A Parking Stall refers to the space for parking of one motorcar, that is, a car parking lot. The space of the stall should be rectangular. The longer side is known as length and the shorter side is the width. In parallel parking, the longer side is parallel to the parking aisle or driveway.

4.12 MINIMUM HEADROOM

The minimum headroom or height clearance from floor level to the underside of any projections including beams, direction signs, sprinkler heads, electrical fittings, etc. shall be 2300mm.

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<td>25-30</td>
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The minimum dimensions required of a car parking stall are as follows:

Stall width: 2400mm
Stall length: 4800mm
Stall length for parallel parking: 5400mm

The area of each stall shall be flat and free from kerbs and other encumbrances.
PLANNING OF MULTISTOREY CAR PARKING

6.1 PLAN CONSIDERATIONS

Plot Area = 2079.70 m²
Car Plot Size = 2.5 m × 5 m
Height of the Floor = 2.8 m
Driveway Width = 4.5 m
Ramp Width = 3.75 m
Total No. of Cars = 277 Cars

No. of Cars in each Floor
Ground Floor = 44 Cars
1st, 2nd & 3rd Floor = 55 Cars
On Terrace = 68 Cars

STAAD DETAILS & DRAWINGS

Fig: Beam detailing
Fig: column detailing
CONCLUSION

From our parking studies and design

The traffic congestion problem can be regulated by providing multi storey parking at jagadamba center. The problem is controlled up to one decade i.e.2026 by providing 275 car parking slots at jagadamba. We hope this project will serve as a solution to various traffic congestion problems and can be used as a model in the development of multi-storey car parking’s.

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