

## PLANNING AND DESIGNING OF PARKING LOTS IN BAHUMALI, SURAT

MANSI G. PATEL, RAJPUT JATIN, PATEL VACHAN K, KUVAR ROBIN A, PATEL MITESH P, TIVADI GOVIND

\*\*\*

**Abstract** – Parking really matters to urban mobility. Due to economic development of state, the urbanization in Gujarat spreading at very fast rate in last few decades. The parking management measure has received considerable attention as a major part of controlling car use in urban areas, but relatively little attention has been paid to the details of the combination of parking strategies proposed in one scheme to assist an area to achieve particular transportation and planning goals. This project focuses on the possible traveler response to various parking control strategies and discusses the implications of this response for program design. Our project "PLANNING AND DESIGN OF PARKING LOTS IN BAHUMALI" can be a revolutionary part of tomorrow. Mainly reduce the time required to park two and four wheel vehicles. It can also be easily controlled by multi-story parking and also saves time and traffic conditions for visitors and other staff.

### 1. INTRODUCTION

#### *What is parking study?*

The enormous increase of vehicles has created the need for parking spaces in metropolitan cities. In industrial, commercial and residential places with multi-storied buildings, parking demand is particularly high. Studies must be conducted to collect the required information about the capacity and use of existing parking facilities. In addition, information about the demand for parking is needed.

#### *Types of parking:*

Parking system is mainly classified in to two system namely:

- a. On - street parking
- b. Off - street parking

**ON- STREET PARKING:** In this type of parking, vehicles are parked on the kerb which may be designed for a parking. Kerb parking is quite convenient for those who could find a suitable space to park their vehicles near the place they wish to atop but for those who could not find a parking space it is a problem an often they may have to park their vehicle at a far off place and walk down to the destination.

#### *Types of on street parking:*

- 1) Parallel Parking
- 2) 30 degree angle Parking

3) 45 degree angle Parking

4) 60 degree angle Parking

5) Right angle parking

#### *OFF STREET PARKING:*

When parking facility is provide at a separate place away from the kerb, it is known as off-street parking. The main advantage of this method is that there is no undue congestion and delay on the road as in kerb parking. But the main drawback is some of the owners will have to walk a great distance after parking the vehicles. It is also not possible to provide the off-street parking facility at vary close intervals especially in business centers of a city. Two basic types of off-street parking are surface parking lots and underground parking garages. Parking lots may be convenient where sufficient space is available at comparatively low cost... If the vehicles are parking and delivering operations being carried out by attendants, it is called attendant parking system. Most important advantage of attendant parking is less space requires storing and parking the same number of cars.

#### *Types of off street parking:*

Types of off-street parking are as follows:

Surface parking

Underground parking

Multi level parking

#### *SURFACE PARKING :*

Surface car parks, properly located and developed on a piece of vacant land or surrounding an office complex or super market, are vary popular with the motorists.

Great care is needed in their design and operation as shown in Fig. The overall aesthetics of the area should received due attention.

#### *UNDERGROUND PARKING:*

The great advantage of underground car parking is that least intrusion they cause to the aesthetics of a place

These parks can be built in the basement of any multi storied building or below open spaces. Since the works involves large quantities of excavating, construction of

retuning walls, ventilation and lighting, such car parks tend to be very costly.

*Multilevel parking:*

It is a building which is designed specifically to be for Automobile Parking and where there are a number of floors or levels on which parking takes place.

Is essentially a Stacked Car Park  
Multilevel Car Park types:  
1. Manually operated (non-mechanized-with ramps)  
2. Mechanized (Classified in different type based on technology)

In order to accommodate the large volume of vehicles, small cities and towns must develop their infrastructure. One solution may be a multi-level car parking system to maximize car parking capacity by utilizing vertical space, rather than expand horizontally. With land in metros cities becoming scarce and dearer, and plots getting smaller, conventional parking is proving infeasible.

**I.PROBLEM DEFINITION:**

People prefer to own cars because cars offer an unmatched combination of speed, autonomy, and privacy. But the fact is that there is no private vehicle is perpetually in motion; most private vehicles spend most of their time at rest, either during working hours or over the night. The imbalance between parking supply and parking demand has been considered as the main reason for metropolitan parking problems. Surat is Gujarat's second largest city and India's eighth most populated in terms of population living in the municipal corporation area, with population of 45 lakh. At present, the city has 21.88 lakh vehicles plying on the roads, including 17 lakh two wheelers and 2.62 lakh cars. Bahumali is the most used PWD building in surat. So in our project we are considering the parking problem and try to give solution for this problem

**II.STUDY AREA:**

The study area of our project is Bahumali building in surat, Gujarat. As it is the government building most of people visit it and parking problem is main at that place. So we will try to plan and design the parking of the Bahumali building so that inimum problem occur. By the study the parking problem in the government buildings such as "Bahumali building" in surat is major problem for the users. Due to more government works the lots of people visit the government building so the traffic problem occur as the no of vehicles are parked. If the vehicles are not parked in the proper manner it may cause disturbance in work.

**3. DATA COLLECTION AND ANALYSIS:**

*DATA COLLECTION:*

*QUESTIONRY SURVEY:*

By providing questionry forms we obtained different data. 40% people from the users are the daily users and 60% are

visitors.

The visitors are mainly faces the problem for parking vehicles or unparked vehicles at the time of leaving. Many people advises for the improvement of parking space.  
questionry form.docx

*LICENCE PLATE METHOD SURVEY:*

Almost average 2000 or more people visits the building daily.

More than 1200 vehicles are parked improperly in which about 1100 2 wheelers and about 60 4wheelers are parked.

*MORNING DATA:*

| location                 | Time               | Numbers of Two wheeler | Numbers of four wheelers |
|--------------------------|--------------------|------------------------|--------------------------|
| zone 1                   | 9:00AM to 11:00 AM | 43                     | -                        |
| zone 2                   | 9:00AM to 11:00 AM | -                      | 4                        |
| zone 3                   | 9:00AM to 11:00 AM | 43                     | 2                        |
| zone 4                   | 9:00AM to 11:00 AM | 36                     | -                        |
| zone 5                   | 9:00AM to 11:00 AM | 4                      | 28                       |
| zone 6                   | 9:00AM to 11:00 AM | 21                     | -                        |
| zone7                    | 9:00AM to 11:00 AM | 560                    | 8                        |
| zone 8                   | 9:00AM to 11:00 AM | -                      | 9                        |
| perifery of the building | 9:00AM to 11:00 AM | 68                     | 15                       |

Table 1: MORNING VEHICLE PARKING DATA

*AFTERNOON DATA:*

| location                 | Time               | Numbers of Two wheeler | Numbers of four wheelers |
|--------------------------|--------------------|------------------------|--------------------------|
| zone 1                   | 11:00AM to 1:00 AM | 60                     | -                        |
| zone 2                   | 11:00AM to 1:00 AM | -                      | 5                        |
| zone 3                   | 11:00AM to 1:00 AM | 58                     | 4                        |
| zone 4                   | 11:00AM to 1:00 AM | 67                     | -                        |
| zone 5                   | 11:00AM to 1:00 AM | 10                     | 39                       |
| zone 6                   | 11:00AM to 1:00 AM | 46                     | -                        |
| zone7                    | 11:00AM to 1:00 AM | 770                    | 16                       |
| zone 8                   | 11:00AM to 1:00 AM | -                      | 10                       |
| perifery of the building | 11:00AM to 1:00 AM | 149                    | 14                       |

Table 2: AFTERNOON VEHICLE PARKING DATA

*EVENING DATA:*

| location | Time              | Numbers of Two wheeler | Numbers of four wheelers |
|----------|-------------------|------------------------|--------------------------|
| zone 1   | 2:00AM to 4:00 AM | 52                     | -                        |
| zone 2   | 2:00AM to 4:00 AM | -                      | 4                        |
| zone 3   | 2:00AM to 4:00 AM | 39                     | -                        |
| zone 4   | 2:00AM to 4:00 AM | 38                     | -                        |
| zone 5   | 2:00AM to 4:00 AM | 4                      | 19                       |
| zone 6   | 2:00AM to 4:00 AM | 25                     | -                        |
| zone7    | 2:00AM to 4:00 AM | 690                    | 13                       |

|                           |                   |    |    |
|---------------------------|-------------------|----|----|
| zone 8                    | 2:00AM to 4:00 AM | -  | 13 |
| periphery of the building | 2:00AM to 4:00 AM | 73 | 20 |

Table 3: EVENING VEHICLE PAKING DATA

Data of 4 days in graphical form:

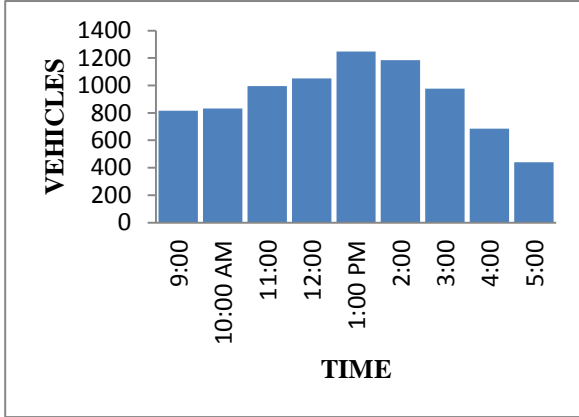


Figure 1:VEHICLES AT DAY 1:

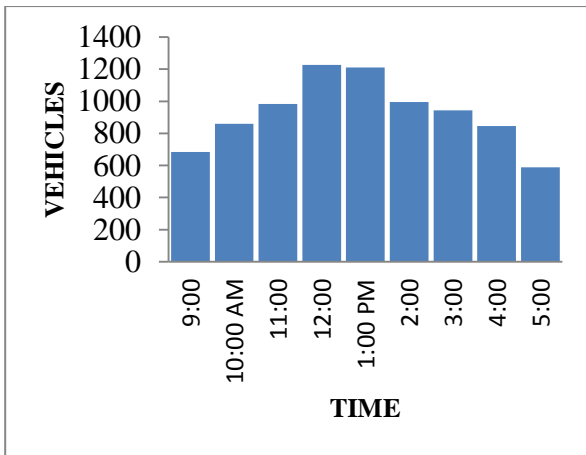


Figure 2:VEHICLES AT DAY 2

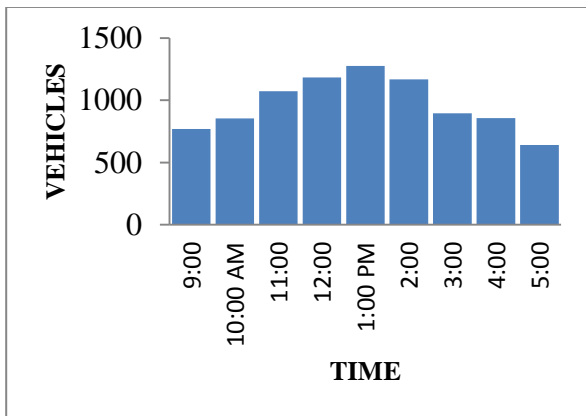


Figure 3:VEHICLES AT DAY 3

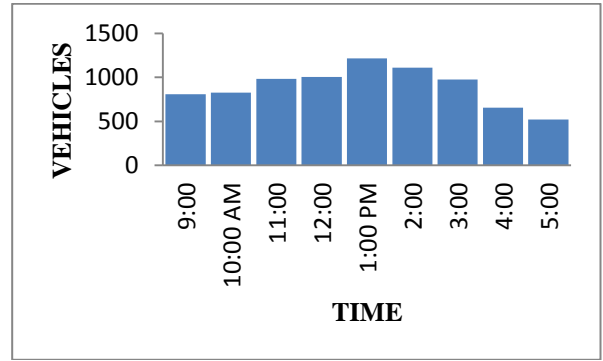


Figure 4:VEHICLES AT DAY 4

4. PLANNING:

- All dimensions are in meters .
- The open space can be used for parking planning process.
- All dimensions are in meters.
- The standard parking space requirements

| VEHICLES      | SPACE       |
|---------------|-------------|
| Two wheelers  | 0.9m x 2.0m |
| Four wheelers | 2.5m x 5.5m |

- Width of the access/exit lane is 2.0m for two wheeler vehicle and 3m for single side and 5.5 for double side (for four wheeler )vehicles.
- Turning radius for normal two wheeler vehicles is 2m.

(SOURCE: IOSR JOURNAL)

- The angle of parking lane is considered according to the area.

RAMP DETAILS:

- The ramp of 1:12 is provided for moving to upper floor.
- (SOURCE: GDCR cl. 4.1.2 Page-27)
- The length of the ramp should be 122foot i.e 37.19 m
- Ramp width is 12 foot i.e.3.05m (SOURCE: Parking standard design guidelines)

STAIRCASE DETAILS:

- For three floors upto 12 m the dimensions are as under. (SOURCE: GDCR cl. 4.1.14 table 1-1.a)

| TYPE OF BUILDING        | FLIGHT | TREAD | RISER |
|-------------------------|--------|-------|-------|
| RESIDENTIAL             | 1m     | 250mm | 200mm |
| INDUSTRIAL AND ASSEMBLY | 2m     | 300mm | 160mm |

Table 4: STANDARD DIMENSION FOR STAIRCASE

5. PLAN:

EXISTING PLAN OF BAHUMALI

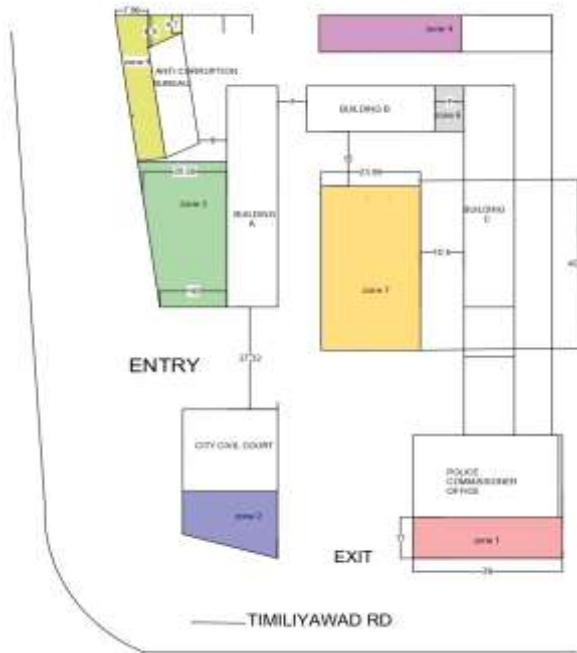


Figure 5: EXISTING PLAN OF BAHUMALI



All dimensions are in meters

PLANNING OF BAHUMALI:

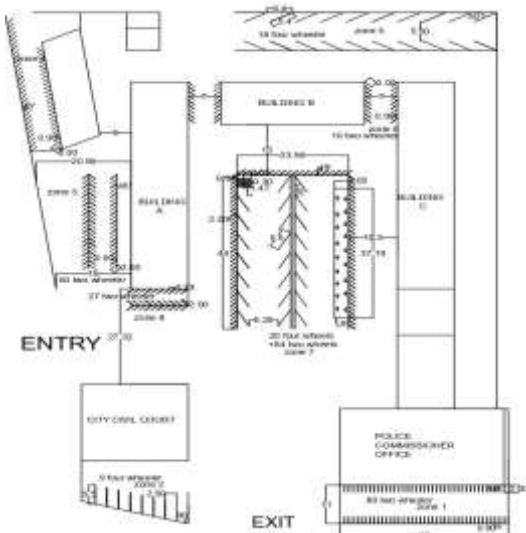


Figure 6: PLANNING OF PARKING AREA



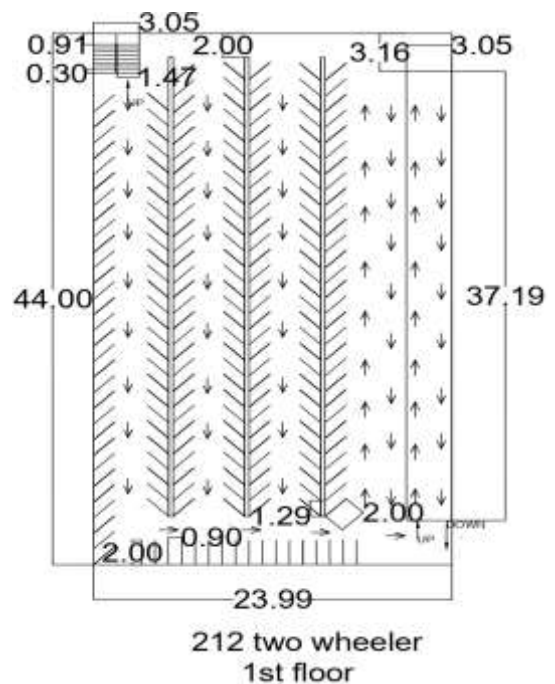
6. ANALYSIS OF PLAN:

As per plan the vehicle parking capacity of different zones is listed as follows:

| Location | Two wheelers | Four wheelers |
|----------|--------------|---------------|
| ZONE 1   | 80           | -             |
| ZONE 2   | -            | 9             |
| ZONE 3   | 60           | -             |
| ZONE 4   | 60           | -             |
| ZONE 5   | -            | 18            |
| ZONE 6   | 32           | -             |
| ZONE 7   | 84           | 20            |
| ZONE 8   | 27           | -             |

- As per planning total 343 two wheelers and 47 four wheelers can be parked in the area.
- But as per study total numbers of vehicles are 1000-1100 which is very high then the capacity.
- So for the solution of excess vehicles the multi level parking is the option. So we will design for 3 storey multilevel parking.
- As per the planning of different stories the parking capacity of each storey are 212 two wheelers.
- So total 979 numbers of two wheelers can be parked in the total space including multi levels.

7. PLAN OF MULTILEVEL PARKING:





## 8. DESIGN OF MULTI LEVEL PARKING:

### STAAD PRO SOFTWARE:

STAAD Pro is a comprehensive structural engineering software that addresses all aspects of structural engineering including model development, verification, analysis, design and review of results. It includes advanced dynamic analysis and push over analysis for wind load and earthquake load.

In STAAD Pro we can analyze the structures in 2D and 3D, for the convenience of modelling and defining the structure for analysis, STAAD uses different templates for 2D and 3D structures. In STAAD we use the following types of structures. Space structures, Plane structures, Floor structures, Truss structures

All the structures are shown in the above figure. Space structures consists of 3 dimensions and structure will have 6 degrees of freedom(6 D.O.F). i.e. 3 rotational and 3 translational.

The plane structures can be considered for any one plane. Forces are considered parallel to the surface of plane or in the surface of the plane. Eg: In XY plane,  $F_x$ ,  $F_y$  &  $M_z$

For the design of horizontal members like slabs, floors etc. the floor structure is used. It is a 2-D or 3-D structure in which horizontal movement cannot be considered.

For the structures only the axial force are considered and there is no bending.

### DETAILS:

- Dead load: ( IS 456:2007)
- Live load: (IS 875: 1987 PART 2)
- Wind load : (IS 875:1987 PART 3)
- Seismic load: (IS1893:2002 (PART 2))
- Load combination: (IS 875:1987 PART 5)

Hence the design is done for this load combination: 1.5(DL+LL).

- Size of beam: 300mm X 300mm
- Size of column: 250mm X 450mm
- Slab thickness=150mm
- $F_{ck}$  =25000KN/m<sup>2</sup>
- $F_y$  =415000 KN/m<sup>2</sup>

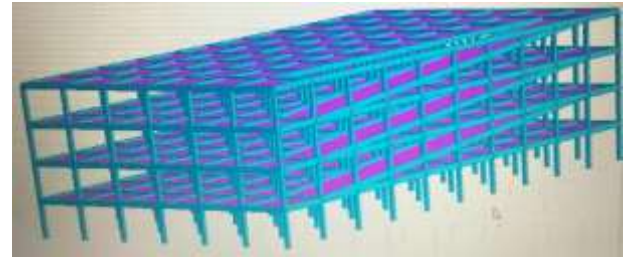


Figure 7; STAAD PRO DESIGN FRAME DIAGRAM

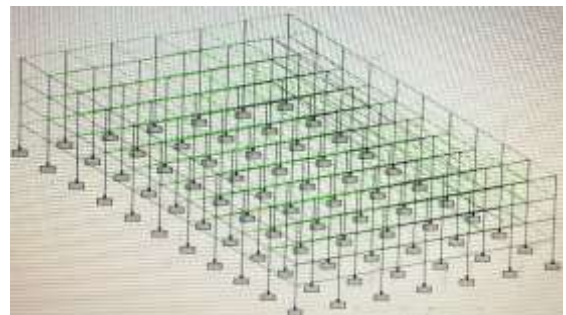


Figure 8: STAAD PRO DESIGN

## 9. CONCLUSION:

Due to proper planning of vehicle parking, Vehicle movement will become easy. As per study about 1050 vehicles are parked which is more according to the capacity of the area.

About 1000 vehicles are two-wheelers and other are four-wheelers.

The capacity of parking area is 343 two wheelers and 48 four wheelers which is very low so multi level parking may be provide.

In our study we planed different parking space and gave design of multi level parking.

As per providing different parking space and parking lots total 979 two wheeler and 48 four wheelers may be parked without disturbing other vehicles.

### REFERENCES:

- GDCR CODE.
- IOSR JOURNAL.
- IS 456:2007 for dead load
- IS 875:1987 for loads
- IS 1893:2002 for seismic load
- Staad pro software for design.
- Sitiesh Kumar Singh- Study of Parking Patterns for Different Parking Facilities .
- Guidelines For the Design of Off-Street Car Parking Facilities.
- Todd Litman Victoria Transport Policy Institute- Parking Management Strategies, Evaluation and Planning .

- Hossam El-Din I. S. Ahmed, Ph.D. Associate Professor  
Car parking problem in urban areas, causes and solutions.
- Prof.Madhuri k. rathi,Mr darshan v. patel- Different types of parking space and multilevel car parking.
- Ahteshamul huq osmani, Ashwini Gawade, Minal Nikam, Swati Wavare-Research paper on Smart City Parking System:
- Abdoulaye Diallo, MSc Student (Corresponding author)- Methodology of parking analysis.
- Mrs Priyanka. Kolhar -Offstreet parking management plan for dharwad city, karnatak