



## MULTI-STOREY PARKING SYSTEM AT VADODARA RAILWAY STATION

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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. The increasing population and expanding urban centers has been accomplished by increasing car ownership and increasing demand for movement for various purposes. Regardless of income or social status, the conditions under which people travel have become more and more difficult and sometimes absolutely intolerable. Demand for transport and travel intensity tends to increase sharply with the growing size of a city and town especially when the city center or major centers of activity continues to grow in terms of both size and employment. Parking in public areas can be very tasking with little or no form of security because it is fraught with all sorts of hazards created by either humans or lack of parking structures. In order to reduce the stress of parking and any form of danger or insecurity to cars and owners, adequate parking facilities must be provided to meet up for the demand of parking.

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**Keywords-** Urbanization, traffic challenges, Designs, Multi-storey car park, Transportation efficiency

### I. INTRODUCTION

Now a day, Traffic congestion has been increasing worldwide as a result of insufficient road development, growing number of vehicles, Low speed, increased accident rates, increased fuel consumption etc. it raises the demand for the concept of intelligent transportation system to the conventional transportation system. The principal reason for traffic congestion in India is that the road, space and infrastructure have not improved on par with the traffic. The seriousness of the problem is reflected in the report of World Bank that estimates the economic losses incurred on account of congestion and poor roads alone run as high as 56 billion a year in India. There is, therefore, an urgent need to explore and develop better traffic management option to ease traffic congestion. Intelligent Transportation Systems (ITS) is a tested route to mitigate traffic congestion problems. ITS can be broadly defined as the use of technology for improving transportation systems. The major objectives of ITS is to evaluate, develop, analyze and integrate new technologies and concepts to achieve traffic efficiency, improve environmental quality, save energy, conserve time and enhance safety and comfort for drivers, pedestrians and other traffic groups. Intelligent Transport Systems represents the next step in the evolution of the entire transportation system. These technologies include the latest in computer, electronic, communication and safety systems. ITS have a central role to play in funding countries' transportation systems.

Intelligent Transportation Systems (ITS) is the application of computer, electronics, and communication technologies and management strategies in an integrated manner to provide traveler information to increase the safety and efficiency of the surface transportation systems. These systems involve vehicles, drivers, passengers, road operators, and managers all interacting with each other and the environment, and linking with the complex infrastructure systems to improve the safety and capacity of road systems.

ITS improves transportation safety and mobility and enhances global connectivity by means of productivity improvements achieved through the integration of advanced communications technologies into the transportation infrastructure and in vehicles. Intelligent transportation systems encompass a broad range of wireless and wire line communication based information and electronics technologies to better manage traffic and maximize the utilization of the existing transportation infrastructure. It improves driving experience, safety and capacity of road systems, reduces risks in transportation, relieves traffic congestion, improves transportation efficiency and reduces pollution.

### II. OBJECTIVES

- To improve traffic safety
- To relieve traffic congestion
- To improve transportation efficiency
- To reduce air pollution
- To increase the energy efficiency
- To promote the development of related industries.

#### Main points of ITS

- Multi Level Parking
- B.R.T.S
- Co-ordination of Traffic Signals
- Electronic Toll Collector etc.

### III. STUDY AREA

Vadodara Municipal Corporation (VMC) is in charge of administration of Vadodara city, the third largest city in the state of Gujarat, with an area of 149 sq kms and a population of 13.06 lakh residents as per 2001 census. The city traces its existence to 1816 with high quality urban infrastructure viz. water supply, drainage, storm water, transport facilities, etc. in the first decade of twentieth century. At the time of country's independence Vadodara had attained the status of an education and cultural centre of Western India. Post independence, the city witnessed quantum industrial and demographic growth with the city infrastructure supporting this growth. However, macro economic developments and growth of neighboring urban centres like Surat and Ahmedabad has resulted in an economic slowdown of Vadodara city in the last decades.

Historical legacy of Vadodara: The last two decades i.e. 1981 – 2000 have been a period of general decline for the city. The 1991 – 2000 has seen a decrease in decadal population growth rate from 40.42% in 1981 – 91 to 26.63%. Implying the city is hardly attracting migration to itself. This decrease is primarily due to reduced employment opportunities available in Vadodara. It would also be pertinent to note that both Vadodara and Surat had a population of about 4.67 Lakhs and 4.93 Lakhs in 1971 respectively, in 2001 the population of Surat was 24.33Lakhs and Vadodara has grown only to 13.06 lakhs. Vadodara is sandwiched between two major growth magnets i.e. Ahmedabad and Surat. Though part of the golden corridor, Vadodara is at a disadvantage in attracting investments, since the only area that it covers is Anand, Panchmahal and Dahod. Also, Vadodara's hinterland on its east gets constrained due to tribal areas and hilly terrain on the border districts of Madhya Pradesh.

#### 4.1 Roads, Public Transport System and Parking:

The city has four flyovers and railways under bridges each. The river Vishwamitri has 11 bridges interconnecting the city areas. The road network within the city is well developed in almost 70% of the area and caters to around 80% of the city's total population. More than 80% of the roads are surfaced of which most of them are black topped while 19% of the roads are earthen. Also, the increased vehicular population has resulted in increased vehicular traffic on the roads. The major roads and intersections experience traffic congestion during peak hours. The present vehicle population of one million is expected to grow to 1.5 million by the year 2011. The high growth projected is due to the fact that the mass transportation system is inadequate and inefficient. Increase in vehicular population will further create problems of pollution and parking. Currently basements of buildings are used for parking resulting in traffic. Also, absence of pedestrian facilities results in traffic congestion and inconvenience to public.

### IV. MULTI LEVEL PARKING

Multi-level parking has come with a number of reliefs since they come with a number of advantages such as optimal utilization of spaces, for comfort for drivers since the stress of struggling for parking space is taken off, more security and environmental harmony.

This research present the design of a multi-storey car park for the mitigation of traffic challenges in public areas using various case studies. Various design aspect which are considered are arrangements of deck and ramp, planning the dimensions, the bay width, aisle width, ramp dimensions, planning grid, alignment paths to exit barriers, means of escape distances, travel distances from the car to the destination, security, visibility, space allowances and lift provision.

#### 4.1 DATA COLLECTED

Existing data of parking condition at Railway Station, Vadodara.

##### ➤ 1<sup>st</sup> Platform

Area=105.6 x 30.65 m

Two Wheeler Parked= More than 1000

Four Wheeler Parked= 63 Approx.

- This is the existing parking condition outside the station where the vehicles are not parked systematically.



***Figure1: Existing Condition of Parking outside Station***

- This is the survey of the area done outside the station to find out the area available for planning of Multi-Storey parking System.

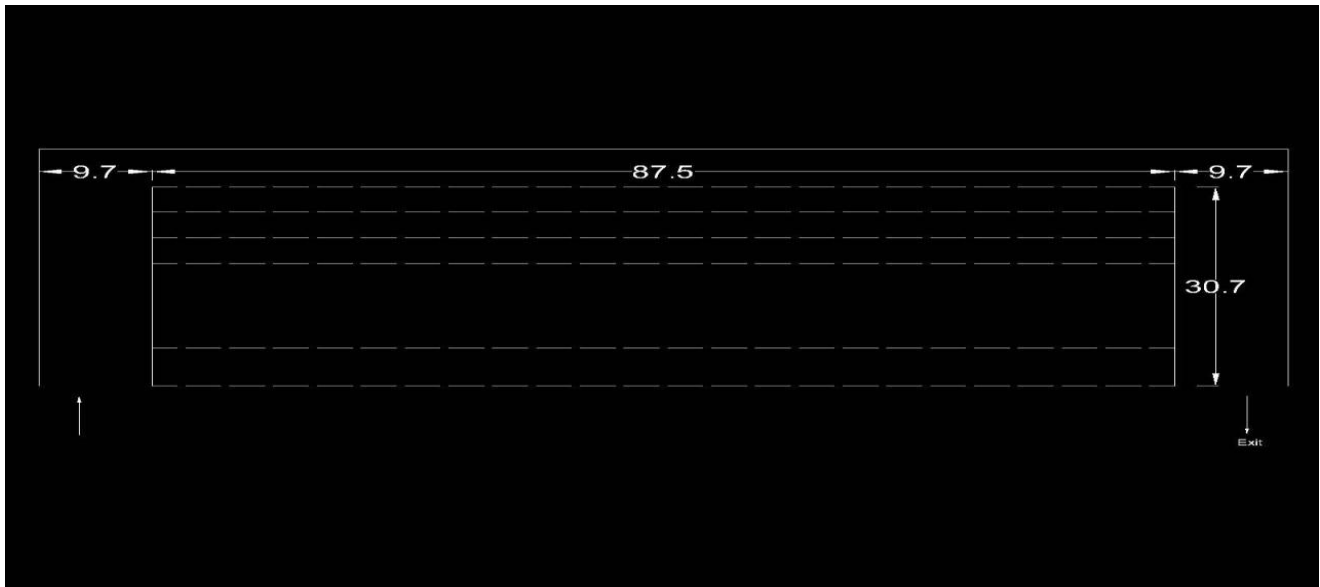


***Figure2: Survey done for the area available outside the station***

#### **4.2 PARKING DESIGNED USING DATA**

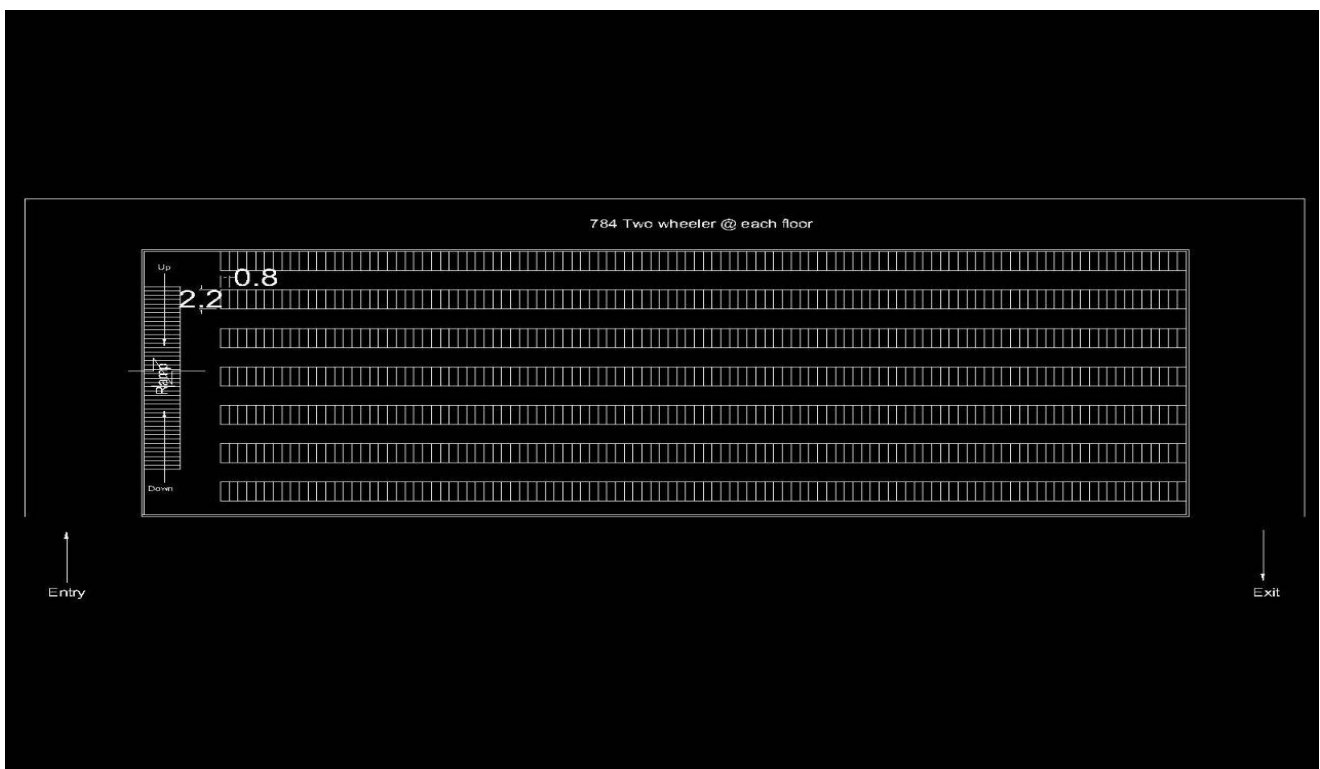
- This is the line plan of the total existing area available at the Vadodara Railway Station. It has Approx. 87m Parking area and approx 9.7m for the entry and exit ways are provided.





**Figure 3: Line plan of station parking area**

- As we know the dimensions of the area, we can design multi-storey parking system at the station. Considering the design criteria of traffic engineering the total of **784** two wheelers can be parked at each floor keeping the station area in mind and this is the line plan of two wheelers parking taking length of vehicle as 2.2m and width 0.8m.



**Figure 4: Two Wheeler parking Plan**

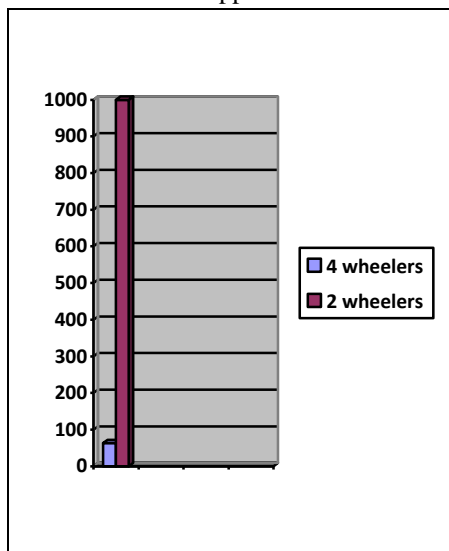
- And this is the line plan for the four wheelers keeping the length of vehicle 5m and width 2.5m. Considering the design criteria of traffic engineering the total of **90** Four wheelers can be parked at each floor keeping the station area in mind.



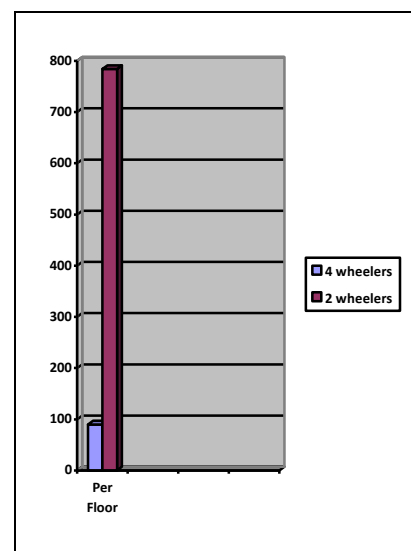
**Figure 5. Four Wheeler Parking Plan**

## V. RESULTS

- This is the comparison of the vehicles that are parked in existing condition and the vehicles that can be parked providing Multi-storey parking. In existing condition approx. 63 four wheelers are parked and approx 1000 two wheelers are parked and after providing Multi- Storey Parking approx 90 four wheelers will be parked on each floor and approx 784 two wheelers will be parked on each floor.



**Chart-1: Existing Conditions**



**Chart-2: After Providing Multi-storey Parking**

## VI. CONCLUSION

From this project it is concluded that the multi storey parking at the Vadodara railway station can accommodate approx 1586 two-wheeler and 190 wheeler. It will improve driving experience, safety & capacity of the road systems, reduces risk in transportation, relieves traffic congestion, improve transportation efficiency and reduces pollution.

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