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# ANALYSIS AND PROPOSAL FOR CONSTRUCTION OF PARKING FACILITY AT MIT COLLEGE CAMPUS

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## ABSTRACT

*Nowadays there is lot of traffic congestion in the Kothrud area of Pune city. As the population is increasing day by day in the urban areas the parking facilities does not meet the supply of traffic. There is scarce of parking facilities within colleges, hospitals, commercial buildings, etc. which leads the users to park along roadside creating congestion for other users as well as traffic congestion. The need for parking facilities is essential in such congested areas of MIT college campus in Kothrud. In this paper, the questionnaire survey and detailed analysis of traffic survey and parked vehicle count are carried out to know the seriousness of parking problems in MIT college campus, current parking problems faced at MIT college campus are identified and likewise the Proposal and solutions are put forward.*

**Key words:** parked vehicle count, questionnaire survey, measurements, 3 stage puzzle parking system.

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## 1. INTRODUCTION

“Parking is space for parking a vehicle in”. Parking facilities is very essential to avoid congestion of vehicles that are caused by roadside parking of vehicles. The proper parking facilities lead to less consumption of fuel which is caused due to searching for parking space within the campus. If parking facilities are not adequate to accommodate the vehicles causing congestion then it will led more people to park their vehicles along roadside having various problems like delay in time to reach college, pollution within campus, health issues, increase in temperature within campus.

Nowadays MIT campus is facing serious parking problems as there are scarce of parking facilities to accommodate the vehicles supply which is maximum than the spaces available within college campus for parking.

The objectives for the study are as follows :-

- To learn about different parking systems.
- To determine the necessity for parking facilities within college campus.
- To plan and propose for construction of convenient parking system to avoid congestion of vehicles in campus.

## 2. LITERATURE REVIEW

The remarkable development of “difficult parking and disorderly parking”, which has critical impacts on citizens’ quality of life and the running of urban roads (3).Unobtainable of sufficient parking lots at rest areas leads to illegal and unsafe parking at entrance/exit ramps, and other unauthorized areas.(1)

It is found that long-term parking is the key reason causing parking congestion, which is due to unclear function orientations of the parking lots.(2) Nowadays, implementation issues including parking detection, reservation guarantee and vehicle to infrastructure(V2I) and Infrastructure to vehicle(I2V) communication reduces driver time ,fuel and expenses (5)

Multi-level car parking system (MLCPS) is one such technology which is implemented in India. It is used for optimum utilization of parking space by utilizing vertical space rather than horizontal space and G+2+2 basement construction and design based on framed structure (4)

The traffic congestion on roads and problem of parking space has been the main area of concern in majority of Indian cities. To avoid such problems, nowadays many new technologies have been emerged that help in solving the parking problems to greater extent. (6)

## 3. CASE STUDY

### 3.1. Data Collection

- Utility Plan of MIT College is collected from MIT planning department.
- Parking plan of North East Parking block is obtained.
- Questionnaire survey was circulated amongst 300 people within campus to know the seriousness of parking problems faced by the people of MIT college.
- traffic flow of MIT college



**Figure 1** Traffic Flow of MIT College.

The MIT college has 2 approaches one from front gate and other from back gate to reach the college. The above diagram shows 2 path in which the traffic flow in campus. There are 2 path of which path 1 shows the traffic flow from MIT college Front gate to Back gate and path 2 shows the traffic flow from back gate road to North East parking block.

### 3.2. Assessment of Study Area

The measurements are noted manually of the distance of parking from front gate of MIT campus to Back gate parking and the measurements of internal roads within campus were also noted.

#### *Distance from Front Gate of MIT college campus to Back Gate parking*

The measurements were taken manually to know the distance between the front gate and the back gate. The total distance from front gate to back gate accounts for 428.24 m.



**Figure 2** Distance Measurements from Front Gate To Back Gate Parking.

#### *Distance measurements from Back gate road to North East parking block*



**Figure 3** Distance Measurements From Back Gate Road to North East Parking Block.

The measurements were taken manually to know the distance between the back gate road and North East parking block. The total distance from back gate road to North East parking block accounts for 258.14 m

***Distance of Back gate parking from back gate road***

The measurements were taken manually to know the distance between the back gate road and Back gate parking. The total distance from back gate road to Back gate parking accounts for 100.07 m.



**Figure 4** Distance of Back Gate Car Parking From Back Gate Road.

Thus all the measurements are noted in tabular form as following:

**Table 1** Measurements of locations

Sr. No	Locations	Distance
1	Front gate to back gate	428.24m
2	Back gate road to North East parking Block	258.14m
3	Back gate road to Back gate parking	100.07m

***Maharashtra State Building Bye Laws (Parking Standards)***

The parking standards are collected from Maharashtra State Building Bye Laws that are used for proposing new back gate parking according to parking standards.

**Table 2** Standard Parking Dimensions

Sr. No	Vehicles	Dimensions
1	Transport vehicles	3.75 m* 7.5 m
2	4 wheeler	2.3 m* 4.5 m
3	2 wheeler	1 m* 2 m
4	Bicycles	0.5 m* 1.40 m

(In case of parking spaces of motor vehicles, upto 50% of the prescribed space may be of the size 2.30 m \* 4.50m).

### 3.3. Questionnaire Survey

Questionnaire survey was circulated amongst 300 people to know the problems of parking that they are facing out of which 217 responses were recorded. The questionnaire circulated consists of following questions:

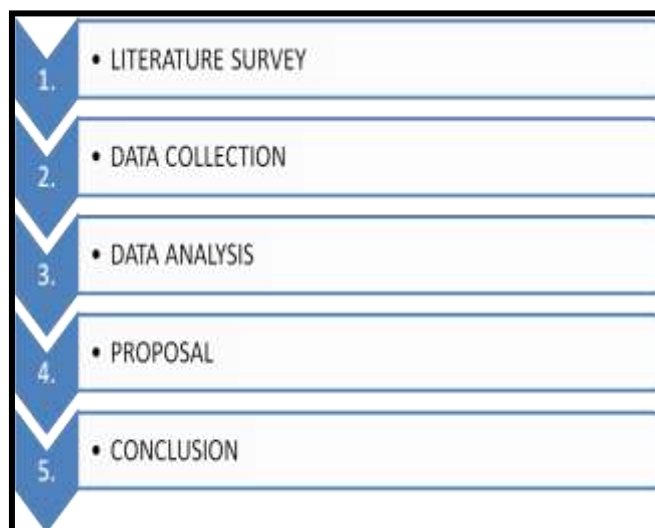
SR. NO	QUESTION	TOTAL %
1.	Do you face parking problems in MIT campus?	
	A) Yes	88.8%
	B) No	4.9%
	C) Maybe	6.3%
2.	What is your mode of transportation?	
	A) Cycle	0.6%
	B) 2 Wheeler	83.2%
	C) 4 Wheeler	11.1%
	D) Walking	4.6%
	E) Others	0.5%
3.	At what time do you come to college?	
	A) 7 - 7:45 am	58
	B) 8 - 8:45 am	136
	C) 9 - 9:45 am	26
	D) 10 - 10:45 am	34
	E) 11 - 11:45 am	9
4.	Do you share your ride or prefer commuting alone?	
	A) Ride sharing	48.4%
	B) Alone	56.8%
5.	Are you interested in reducing CO2 emissions within campus?	
	A) Yes	92%
	B) No	8%
6.	Do you face problems while taking out their vehicles due to improper parking?	
	A) Yes	75.5%
	B) No	7%
	C) Sometimes	17.5%
7.	Do you prefer cycle to reach college to reduce CO2 emission?	
	A) Yes	21.2%
	B) No	78.8%
8.	Which parking will you prefer?	
	A) Elevated	52.6%
	B) Underground	47.4%
9.	Are you willing to use public transport for approaching college?	
	A) Yes	31.8 %
	B) No	42.1 %
	C) May be	26.2 %
10.	Distance of your home from college campus	
	A) 0 - 2 km	12.2 %
	B) 2 - 4 km	22.2 %
	C) 4 - 6 km	16 %
	D) 6 - 8 km	10.8 %
	E) 8 - 10 km	10.4%



	F) 10 - 12 km	7.3%
	G) > 12 km	21.1%
11.	Any damage caused to your vehicle due to improper parking?	
	A) Yes	70.8 %
	B) No	19.8 %
	C) May be	9.4 %
12.	Distance of your home from college campus	
	A) Front Gate	11.4%
	B) Back Gate	26.5%
	C) Near Globe	19.4%
	D) Near your Department	19.4%
	E) In front of MIT polytechnic	11.4%
	F) Behind MIT Skill Development Building	4.6%
	G) Other	7.3%

#### 4. METHODOLOGY

In this paper, firstly questionnaire survey was carried out amongst 217 users including students as well as staff, then the seriousness and problems at current back gate parking were identified. Secondly, the traffic survey was carried out and the proposal is put forward that ease the problems of parking as well as accommodate more vehicles than existing within the campus. Finally, recommendations are put forward to improve campus parking at MIT campus.



#### 5. ANALYSIS

The Traffic supply and demand survey was carried out to find out the supply as well as the demand of vehicles in campus of MIT college. The above tables comprises of the count of bicycles, Auto rickshaws, 2-wheelers, 4 wheelers on various days to know the daily count of all the vehicles that are parked in campus. The Traffic supply and demand survey was carried on Monday, Tuesday, Saturday during regular college timings. On each day survey was carried out twice from 9 am to 12pm and from 2 pm to 5pm to determine the count of parked vehicles. This survey was again done during NIRMITTE event which is conducted by MIT college every year.

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Large number of students participates in various competitions and come to MIT college during this event which increases the number of vehicles within the campus. The survey was carried out during NIRMITEE event resulted in large number of vehicles that didn't have parking facilities. As per survey the highest count was noted on Wednesday and total vehicle count around the campus was 5348 and the maximum parking capacity of the MIT campus is of 2824 vehicles. Therefore there are almost 2524 vehicles that don't have parking facilities resulting in congestion within and around the MIT college campus.

**Table 3** Parked vehicle count and maximum parking capacity on Wednesday

DATE- 21/03/18		DAY- WEDNESDAY		TIME- 2 pm to 5 pm			
SR. NO	PLACES	BICYCLE	2 WHEELER	AUTORICKSHAW	4 WHEELER	TOTAL	Maximum Capacity
1	MIT FRONT ROAD	8	329	12	35	384	
2	MITFRONT GATE SIDE ROAD		153		15	168	
3	MIT FRONT GATE GROUND			4	62	66	52
4	SARASWATI VISHWA A PARKING	4	769			773	762
5	SARASWATI VISHWA B PARKING -1		281		18	299	250+18= 268
6	SARASWATI VISHWA B PARKING -2	5	373			378	350
7	BEHIND MANAGEMENT BUILDING				63	63	62
8	NEAR CANTEEN(Front gate)	2	288		25	315	250+24= 274
9	OPP. TO CANTEEN	4	221			228	200
10	BEHIND POLYTECHNIC BUILDING		219			219	200
11	LEFT OF GLOBE (ROAD)	18	413		24	455	
12	RIGHT OF GLOBE (ROAD)	6	421		26	453	
13	POLYTECHNIC BUILDING PARKING		159			159	80
14	BACK GATE CAMPUS PARKING		241		32	273	56+24= 80
15	PETROLEUM BUILDING		252		17	259	220
16	CIVIL BUILDING		129		25	154	120
17	MIT COE (ROAD)				26	26	
18	MIT COE PARKING NEAR MITCOE C	4	168		13	178	156
19	MIT CRICKET GROUND						
20	BACK GATE CAMPUS ROAD	2	431	6	45	484	
	<b>TOTAL</b>	<b>53</b>	<b>4847</b>	<b>22</b>	<b>426</b>	<b>5348</b>	<b>2824</b>

Survey was carried out twice on the following days and maximum parked vehicles count was noted on Wednesday. 2524 surplus vehicles (including both 2 wheelers and 4 wheelers) don't have parking facility. Thus, there is serious problem of parking within the campus and there is need for construction of parking facilities within the campus.

**Table 4** Traffic Volume Count

SR.NO	DAYS	TIME	TOTAL PARKED VEHICLES COUNT	MAXIMUM PARKING CAPACITY	SURPLUS VEHICLES
1	Monday	9am to 12 pm	4978	2824	2154
		2pm to 5pm	4929		2105
2	Tuesday	9am to 12 pm	5244		2420
		2pm to 5pm	5251		2427
3	Wednesday	9am to 12 pm	5302		2478
		2pm to 5pm	5348		2524

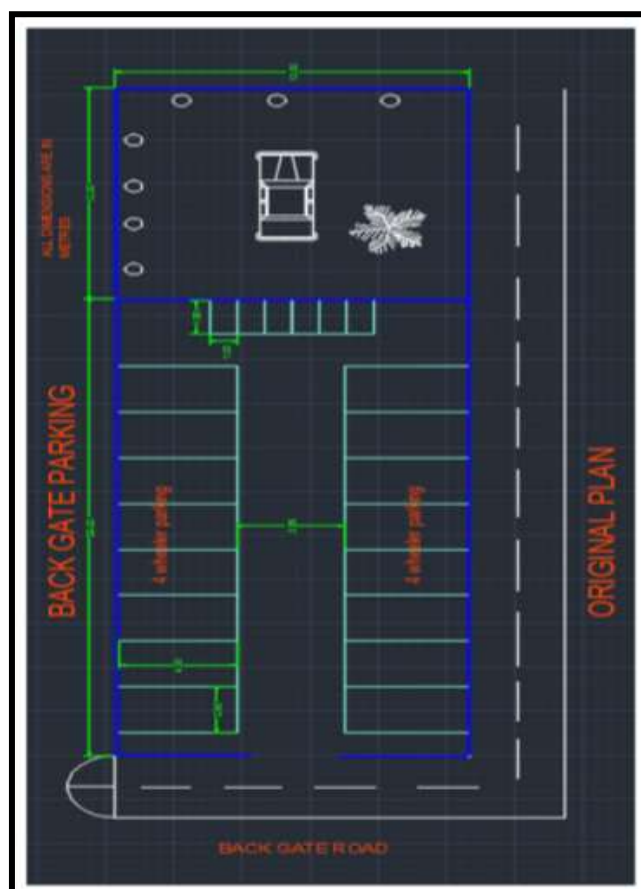
The traffic volume count was done on various days to know the amount of vehicles parked within college campus as well as the maximum parking capacity of the college so, from this data surplus vehicles are calculated that don't have parking facility available.

### 5.1. Current Back Gate Conditions

The existing parking is depicted in AutoCAD drawing. The current back gate parking consists of both 2Wheeler as well as 4Wheeler parking. It has capacity of 16 4wheelers and 6 2wheelers. Total area of back gate parking is 494 sq. m out of which 156 sq. m is not to be used for parking. Thus area useful for parking is of only 338 sq. m. The problems identified at the existing parking are as follows:-

The problems identifies in current Back gate parking are as follows:

1. The current Back gate parking has only one entrance from where the vehicles enter as well as exits which creates a lot of congestion for vehicles while taking out their vehicles during exit.
2. The vehicles are parked in an unorganized manner which creates less parking facility for other vehicles to park.
3. The width of entrance is comparatively less which can cause damage to vehicles.
4. Currently having capacity of 16 4wheelers and 6 2wheelers and total space is not efficiently utilized.
5. People using front gate to approach the Back gate parking creating a lot of congestion with campus, more fuel consumption, carbon emission within the campus, more time consumption as well as comparative more distance to travel, etc.



**Figure 5** Existing Back Gate Parking Condition.



## 5.2. Calculations of the Time Requirement

The time require to reach college was calculated from Main road (Paud road) to front gate of MIT college, similarly the time required to reach Back gate parking from Front gate of campus was also calculated which all are shown in the following table:

**Table 5** Time Required to Reach Back Gate Parking From Main Road.

Sr. No	Locations	Time	Speed
1	Main road to Front gate	1.33 min	30 km/hr
2	Front gate to Back Gate	1.18 min	15km/hr
	Total	2.55 min	

**Table 6** Time Required to Reach The Back Gate Parking From Back Road.

Sr. No	Locations	Time	Speed
1	Back road to Back gate parking (from Main road )	2.06 min	30 km/hr

From the above tables, the time required to reach the Back gate parking from Front Main road accounts for 2.55 min while the time required to reach the Back gate parking from Back Main road accounts for 2.06 min.

Therefore total time saving =  $2.55 - 2.06 = 0.49$  min.

## 5.3. Calculations for Distance Saving

As from the measurements taken earlier, the distance from front gate to back gate parking is 428.24m, while the distance from back road to back gate parking is 100.07m.

Therefore, total distance saving =  $428.24 - 100.07 = 328.17$  m

Similarly for North East parking block the distance from front gate is 428.24m ,while from back road the distance is 258.14 m

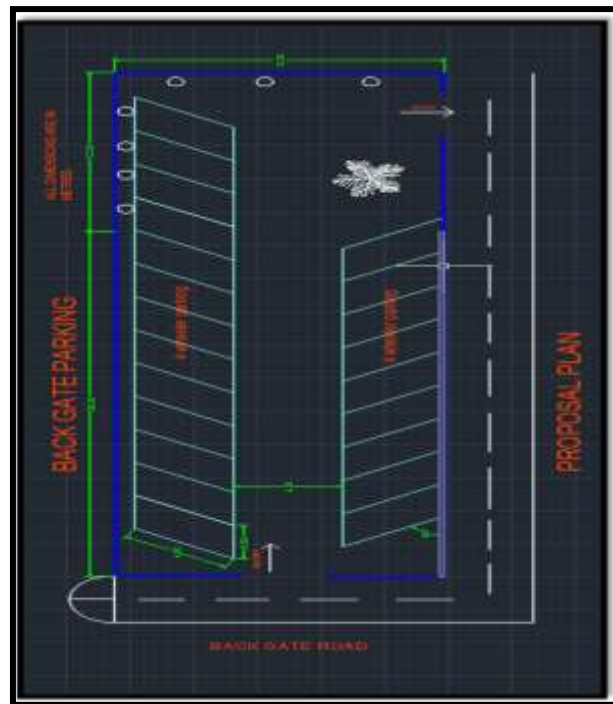
Therefore, total distance saving =  $428.24 - 258.14 = 170.1$  m.

So, instead of using back road to approach for back gate parking a total distance of 100.07m will be saved and similarly, if the back road is used for approaching North East parking block then we can save a total distance of 170.1m.

## 6. ALTERNATIVE PROPOSAL

### 6.1. Proposed Back Gate Parking For 4 Wheelers

From above problems identified a new parking facility is proposed as follows:



**Figure 6** Proposed Back Gate Parking at MIT College.

The above figure represents the Auto-CAD drawing of proposed Back gate parking which is much needed to reduce all the problems identified. This proposed parking will be 3-Stage hydraulic puzzle parking system which will accommodate 3 times more vehicles in an organized manner. The parking is placed at 60 degrees which have many parking lots which can accommodate 60 4wheelers vehicles. This proposed parking has separate entrance and exit which reduces the vehicles congestion at the parking.



**Figure 7** Elevation of 3 Stage Puzzle Parking System

This parking system is proposed for 4 wheelers. In this 3 stage puzzle parking system there are 3 stages, so in first stage mostly the frequent users will park. In 2nd stage the users which have to exit at 12pm will park and in the 3rd stage the users which have to exit till 5 pm can park their 4 wheelers .

The elevation of the proposed parking 3 stage puzzle parking is as follow:

## 6.2. Benefits of Proposed Parking at Back Gate over Current Parking at Back Gate

1. The proposed parking will have the entrance from Back Gate which will reduce the congestion of vehicles at the Front Gate.
2. Separate entrance and exit is provided in new proposal which will led to proper flow of traffic.
3. New proposed parking will accommodate 60 4-wheeler.
4. Less time will required to reach the parking from Back Gate.
5. The vehicles do not have to travel the whole campus which will increase Carbon emission within campus.
6. Less pollution within the campus.
7. TBI committee of MIT college needs a proposal for such type of parking which can accommodates large number of vehicles ,so this parking can solve many problems as there is scarcity of parking facility within the college.

## 7. CONCLUSIONS

The above analysis depicts that there is scarce of parking space for 2524 vehicles in the MIT college campus. So, there is great need for management of parking system in Maharashtra Institute of Technology college, Kothrud, Pune.

The proposed parking plan at Back Gate accommodates 60 4wheeler vehicles instead of 19 4wheeler vehicles saving the time of 0.49 min and a distance of 328.17m. This proposed parking will also reduce air pollution to some extent as the vehicles will reach the parking from back road instead of travelling overall campus.

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