

## Design of intersection and parking spaces for RTS-B Ramagundam

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### Abstract

In India Power Generation sector is experiencing tremendous growth with the increase in both development and environmental deterioration. Development is taking place in income levels, living standards in all respects of socio economic characteristics. Consequently this leads to increases in the demand for new transportation facilities as well as upgrading of the existing facilities. Keeping this in view an attempt is now made in the present study to estimate demand for transportation facilities for an area where the power generation sector is expanded. Assuming that the system will have an effective influence only within the premises of colony and industrial area, new zoning scheme has been proposed to identify the travel characteristics among the study area. The traffic volume count has been carried out to know the trips which are going from internal to external at central office and at entrance and exit of the area. Improvements in transportation facilities like design of Mini round about providing of parking spaces in the industries premises are proposed.

**Keywords:** Parking spaces, RTS-B Ramagundam, socio economic, Ramagundam thermal power station.

### 1. Introduction

#### 1.1 General

Transportation plays an important role in the political, economic and social development of any society. As a society grows in terms of population and functions, the need for various components also grows thereby requiring quality and effective transportation systems. In the words of there is no escape from transport even in the most remote and least developed of inhabited regions. It is also opined that "there seems to be no other types of development which can effect so speedily a change in the economic and social conditions of backward nations except transport".

#### 1.2 Development of Power Generation Sector in India

Power, being considered as an engine of growth, has always been a focus area for most of the developing countries, including India. The power generation in India has increased from 1362 MW in 1947 to 1, 20,000 MW during 2004-05 and at present total installed capacity is 2,28,722MW and planned to increase 3,00,000 MW by 2017. Global Coal reserves are expected to last another 200 years. India also has a vast coal reserve of 211 billion tones making coal one of the most extensively used fossil fuel for generating power. Hence there is a rapid growth in areas surrounding areas with an increase in power generations.

##### 1.2.1 TSGENCO

Telangana Power Generation Corporation (TSGENCO) is the third largest power utility in the country and it is the largest power generating company of T.G. State with installed capacity of 4365.3 MW comprising 2282.5 MW Thermal, 2081.80MW Hydel and 1 MW from Renewable Energy Sources.

In view of proposed projects like Lift Irrigation and Drinking water supply schemes by T.G. government. To meet the needs

of demand as a part of it Ramagundam thermal power station with installed capacity of 62.5MW which is increased to 500 MW.

#### 1.3 Demand for Transportation Facilities

The demand for transportation is known as a "derived demand". This demand is derived from economic activity that is the result of peoples' requirements to earn a living, enjoy leisure activities, and consume goods and services. The production, supply, and distribution of goods and services create the demand for freight movements. Thus, the social, demographic, and economic factors that create the demand for transportation will also determine the type of transportation system that will be necessary in the future. This means that these factors must be considered when developing transportation plans. Some of the major social, demographic, and economic trends that will affect transportation demand and, therefore, future transportation system needs are presented in subsequent chapters.

#### 1.4 Need for the Study

By the growth of the industries, urbanization takes place with an increase in demand for transportation facilities especially the road network. To arrive at a better picture for decision making for selection among various transportation alternatives in systems, there is a need to quantify benefits and costs. Travel demand estimation is must for future traffic distribution. This can be used for design of improvements and view its viability. The case study of the existing road network with the proposed improvements gives a better picture about the future road network condition and can view its viability.

#### 1.5 Objectives of the Study

The present dissertation work is taken up to propose rotary at the junctions and provide parking spaces in the industries.

## 2. Literature Review

### 2.1 Surveys to Collect Data

The first stage is to form a transportation plan is to collect data on all factors that are likely to influence travel pattern. Surveyors can collect data

1. At home
2. During the trip and
3. At the destination ends of the trip.

Some of the surveys that are usually carried out are,

**(a) Road side interviews** of drivers, usually at the exit of a cordoned area. Sampling fractions of 1 in 5 may be considered typical but they certainly depend on traffic levels and manpower available. They are carried out on different days but at similar times. They tend to be expensive in manpower, delays to vehicles and processing.

**(b) Home interview survey Method.** Although usually not considered reliable enough for a detailed design of, for example, a traffic management scheme, they may be the result of a large study and be available for cross-checking. The method is expensive on manpower and time consuming.

**(c) Flagging methods.** It is possible to identify vehicles at cordon and internal points by means of registration numbers, stickers or by asking drivers entering at a given point to switch their lights on. This method has only been tried for very small areas (roundabouts).

**(d) Taxi and Public transport surveys:** Large urban areas usually have sizeable amount of travel by taxis and buses. In order to minimize the delays the interviewer may enter the vehicle and carry out the interviews when the vehicle is in motion.

**(e) Aerial photography.** To a large extent this method is experimental, it requires a good deal of processing to identify cars and track them in a computer readable form. It is only successful for small areas but improvements in the automatic identification of vehicles may increase their applicability. It is the only method which does not necessarily require sampling.

## 3. Methodology

### 3.1 General

As city expands to accommodate the growth in population and activities, the spatial separation between the population and employment locations increase, increasing needs for travel modes are felt. The daily needs of residents for work, education, business, shopping and recreation create enormous demand on transport system.

The past studies and network in the area are just based on the agrarian population rather than the Industrial population. The Growth is towards the Rapid Industrialization and a predominant increase in basic standard living condition. So as to make improvement in Transportation for the existing Network design of intersection and parking are done. The present study has been aimed to utilize these data source for the present selected Transportation Network analysis.

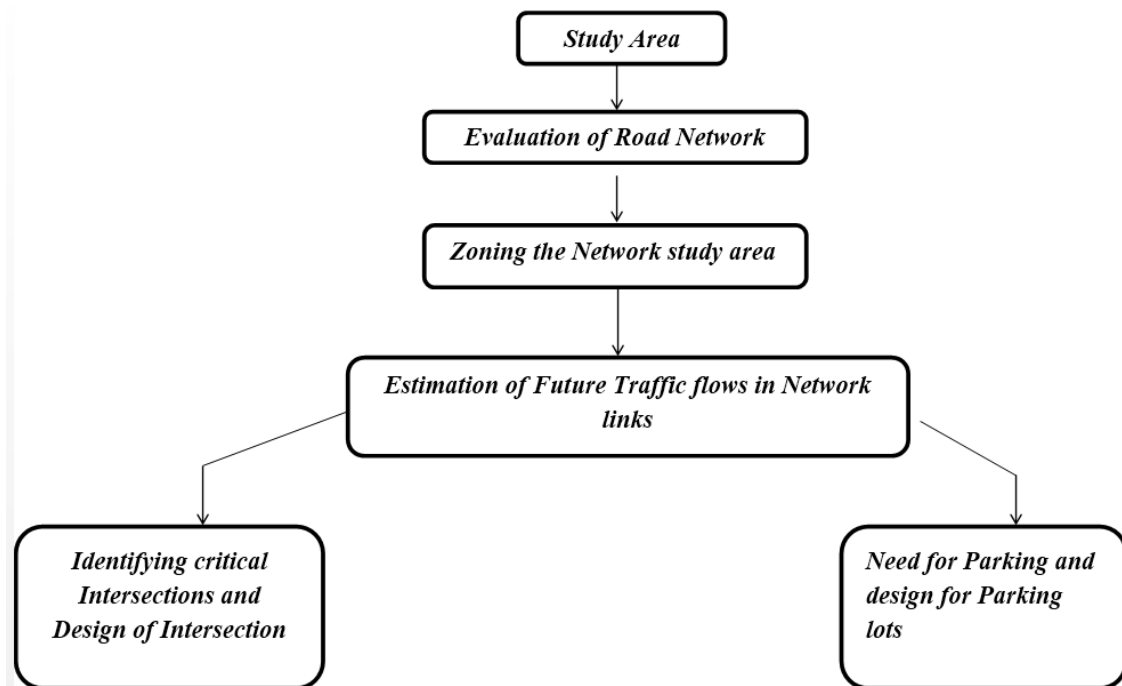


Fig 1: Study Methodology

### 3.2 Study Methodology

The study methodology adopted in the present dissertation work is presented in the flow chart as shown in the figure 3.1 and the various steps of proposed methodology are discussed in subsequent articles.

### 3.3 Intersections and Design of Rotary

An intersection is defined as the area where two or more roadways join or cross. The importance of design of the intersection stems from the fact that efficiency of operation, safety, speed, cost of operation and capacity are directly governed by the design.

The forecasted traffic volumes are considered for design of intersections. There is a space constrain, hence mini Roundabout will suite the site for design. The capacity of mini roundabout is given as

$$q = K (\sum w + a^{1/2}) \dots\dots\dots (3.1)$$

Where, q = total entry volume in PCU/day

$\sum w$  = sum of the basic road width used by traffic in both the directions to and from the intersections, in meters.

a = area of junction widening, i.e. the area within the intersection outline which lies outside the area of basic cross-roads in sq.m.

K = efficiency coefficients with depends upon site conditions, the recommended values of the K (PCUs per Hour is mentioned in the table 3.2.

**Table 1:** Recommended K values (PCUs per Hour)

Type of Junction	K values (PCUS per hour)
3 way junction	80
4 way junction	70
≥ 5 way junction	65

The practical capacity is about 80% of that of the given above equation. To maintain the junction capacity a single lane approach should be tapered to give at least three lanes at junction and a 2 lane approach tapered to at least four lanes at junction. At the exits, the merge should normally be from four lanes to two lanes and two lanes to one lane. Provision of small diameter island of a diameter of about one third that of a hypothetical circle inscribed with in the outer carriage way boundaries, and should be generally taken about 4 M to 8 M.

**3.4 Parking and Its Requirements**

Parking is one of the serious problems that confront the urban planner and the traffic engineer. Parking demand is a function of land use, though variation can exist within the same land use. Notwithstanding the difficulties that arise in prescribing a uniform parking space requirement standard for all communities, it is possible to prescribe minimum standards based on extensive experience.

**3.5 Summary**

This chapter dealt with the design of parking spaces in industrial area i.e., in power plant area and design of intersection where it is required.

**4. Data Collection and Preliminary Analysis**

**4.1 General**

This chapter covers in detailed data collection process and primary analysis are discussed based on the procedure mentioned in the methodology.

**4.2 Description of the Study Area**

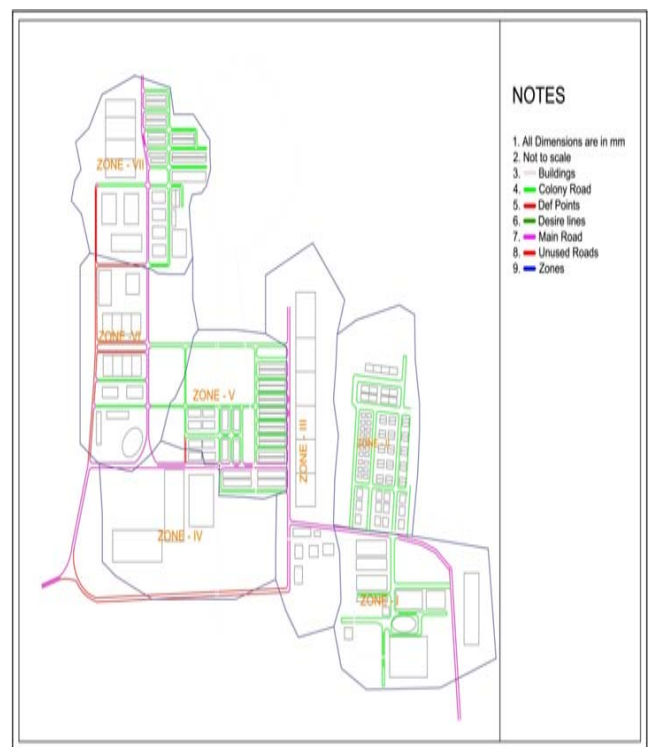
The Present study is done in Ramagundam B Super Thermal Power Plant colonies, which is located at Ramagundam in Telangana. The power plant is one of the coal based power

plants of TSGENCO with an installed capacity of 62.5 MW (single unit). The plant was established in the year of 1971. Now the surrounding rural population is settled in and around the colony premises.

Due to availability of land, water resources and fuel material (Coal) in the near vicinity TSGENCO has proposed for extension of power plant from an installed capacity of 62.5 MW to 500 MW within the next two years. However the existing road network and transportation facilities are designed in 1970 modified and developed in the 1990's. Hence the present area is being selected for study purpose. The present study area is as shown in the figure 4.1

**4.3 Zoning the Study Area**

The entire region of Ramagundam TSGENCO power plant and the surrounding area is sub divided in to seven zones based on the land use characterises. These zones are as shown in the figure 4.1



**Fig 2:** Study area indicating zones and road Network

While dividing the study area into zones the following guide lines are must have to be followed.

1. Zone should be homogeneous in land use as far as possible.
2. The zone boundaries should match with administrative boundaries.
3. The zone should match with manmade and natural boundaries as far as possible.

Table 4.1 shows population and employment details of the zones collected from previous and censuses-2011 studies and information from the local municipality and industries situated in the study areas i.e. TSGENCO. Based on these zone details, one can be able to forecast the future population and employment and are also shown in Table 4.1 only.

**Table 2:** Zone characteristics of study corridor

Zone No	Zone Name	Population			Employment			Characteristics
		2011	2015	2021	2011	2015	2021	
1	Power plant area	938	1313	5710	653	911	1218	Complete industrial area with power plant and low housing
2	B-colony	2456	2943	5616	323	356	471	Fully Residential area along with small retail shops
3	Masjid corner & Shopping Area	2564	3123	5368	872	923	842	commercially developing area
4	Central office Area	2587	3421	9201	1065	1121	1840	Offices area
5	A-Colony	2098	2937	3194	564	635	1295	Fully Residential area along with small retail shops
6	Market & School Area	1987	2481	2972	245	332	594	Market, shopping & schools
7	C- Colony	2678	3349	3818	123	196	258	Fully Residential area along with small retail shops

**4.4 Data Collection and Preliminary Analysis of Data**

The surveys conducted for the present study are

1. Traffic volume count for Preliminary Analysis of Data

**4.4.1 Traffic Volume Counts**

In the present study, manual counts of traffic are conducted at three different locations along the major road link. The three different locations are the entrance of the study area, exit of the study area and near central office where maximum flow is obtained. Surveys are conducted for 16 hours to collect volume in both directions. Traffic volume count Data format sheet is presented in Appendix A.

The location of the survey and the corresponding traffic volume for 16 hours is mentioned in the table 4.3 and the total volume is converted into passenger car unit obtained per day trips by multiplying the traffic volume count with Equivalent passenger car unit's factors given in the table 4.2. Passenger car units count obtained is presented in Table 4.3.

**Table 3:** Equivalent PCU value factors by Vehicle type

Vehicle type	Equivalent PCU value
Bus	3
Mini bus/van	1.5
Car	1
2 Wheeler	0.5
Auto Rickshaw	1
2 Axle Truck	3
3 Axle Truck	4.5
MAV	4.5
LCV	1.5
Tractor	4.5
Cycles	0.5
Hand/Animal drawn carts	4

**Table 4:** Total traffic volume count at Intersections

Location	Towards intersection	From intersection
Central Office	502 pcu/hr	517pcu/hr
Ramagundam	188pcu/hr	177pcu/hr
Power plant	715pcu/hr	688pcu/hr

**4.2 Summary**

This chapter describes data collection for preliminary analysis is presented.

**5. Design of Intersection and Parking Lots**

**5.1 Design of Mini Roundabout**

The future forecasted volumes are assigned on the junction and are as shown in the figure. As the peak Hour may be assumed as 8 to 10% of the day volume, we obtained the

following values. These are more than 500 pcu/hr, Design of rotary is suggested.

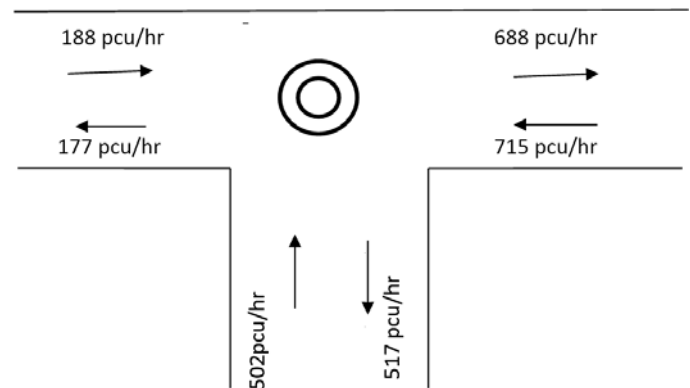
As per the space constrain in the study area mini round about is selected as mentioned in section 3.2, diameter is one third of the hypothetical circle inscribed in the area. The circle inscribed is of 14 meters

Therefore, diameter of mini round about = 14 x 1/3 = 4.6 meters

$$\begin{aligned} \text{Practical capacity} &= \text{sum of all capacities in all the directions} \\ &= 188+688+175+715+502+517 \text{ pcu/hour} \\ &= 2335 \text{ Pcu/ hour.} \end{aligned}$$

The proposed and designed road is of two lane, as per the standard conditions and as mentioned in section 3.7, the two lane road is tapered to 4 lane at the entrance and again from four lane to three lane and then to two lane in a distance of 100 meters.

As the junction is a 3 way junction, K = 80



**Fig 3:** Three way intersection with the capacities.

Hence capacity,  
 $q = K (\sum w + a^{1/2})$

$\sum w$  = sum of the basic road width used by traffic in both the directions to and from the intersections, in meters.

$$= 7+7+7 = 21 \text{ M}$$

a = area of junction widening, i.e. the area within the intersection outline which lies outside the area of basic cross-roads in sq.m.

$$a = (0.5 \times 100 \times 7) \times 2 \dots \dots \dots \text{(Both the sides)}$$

$$= 700 \text{ sq.m.}$$

$$\text{Now, } q = 80 \times (21 + \sqrt{700}) = 3796.60 \text{ Pcu/hour}$$

$$\text{Practical capacity} = 80\% \text{ of estimated Capacity}$$

$$= 3796.60 \times 0.8 = 3037.28 \text{ Pcu/ hour.}$$

$$\text{Therefore, } 2335 \leq 3037 \text{ Pcu/hour}$$

Hence safe.

## 5.2 Design of Parking Lots

Parking space is provided in zone 1 i.e. in power plant area for the future trips. Based on the IRC specifications the space provided for community car parking is 2.5mX5m. For two wheeler a stall of 0.8 m x 2.5 m is provided. Parking area required per bicycle is 1.4 to 1.8 sq.m

As per the standard specification provided in the table 5.8, for the built up area in the industries premises the parking spaces are calculated.

**Table 5:** Indicative values of Parking space standards as per the land use.

S.No.	Land use	parking Space Standard
1	Industrial Premises	One space for up to 200 sq. of initial floor area. Additional spaces at the rate of one for every subsequent 200 sq. of fraction there of

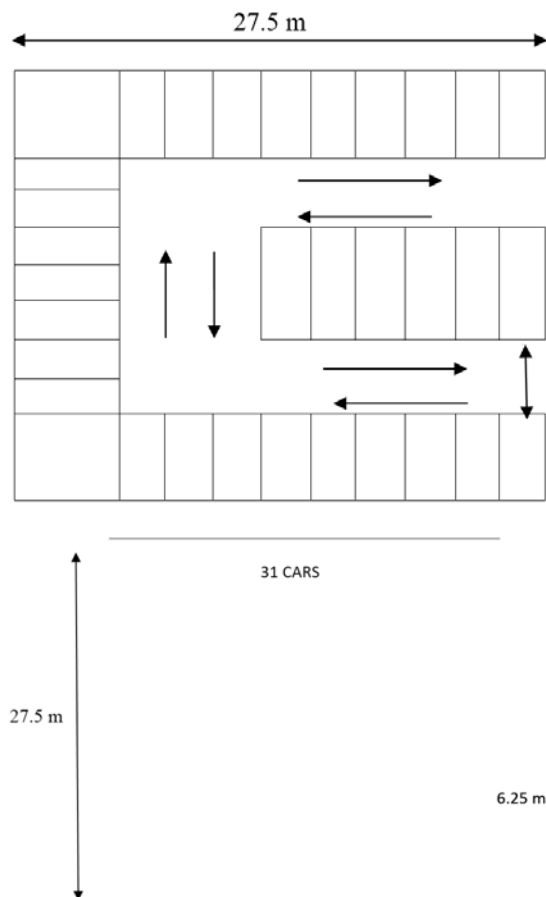
Industrial premises area in the power plant = 541 m x 142m = 75740 sqm

Therefore,

No. of spaces requires =  $75740/200 = 378.7$  or say 380 parking lots.

As per the past studies and the Employment and vehicle owner ship details collected for the Ramagundam Thermal power plant TSGENCO, only 7 % of the employees are using four wheelers, so car parking spaces to be provided are =  $380 \times 0.07 = 26.6$  or say 28 spaces.

Typical layout of parking areas with 31 cars is shown below in the figure 5.4



**Fig 4:** Typical layout showing parking space with 31 cars

## 5.3 Summary

This chapter has sketched in detailed design of facilities like parking spaces in power plant area and intersection according to IRC codes.

## 6. Discussions and Conclusions

### 6.1 General

The chapter presents the summary of work done and conclusions drawn, specific recommendations are made. Limitations of the present study and scope for future work are also presented in this chapter.

### 6.2 Summary

Due to the tremendous growth of vehicle population, the limited lane width, right of way, congestion, inadequate facilities at intersections, parking are the problems to be faced in the near future. To solve all above problems there is a need to develop improvements in the transportation system.

As per proposed methodology, the data collection through preliminary surveys was carried out through traffic volume counts from external to internal and internal to external at entrance and exit and central office of RTS-B Ramagundam for the design of intersection. Detailed design of the intersection i.e., mini roundabout and parking spaces required in power plant area are explained.

### 6.3 Conclusions

Conclusions drawn from the present study are listed below:

1. From the present study of Ramagundam Thermal plant, it is observed to be a rapid growing industrial area which in turn raised the need to upgrade the existing transportation facilities.
2. From the present study one can conclude that the Traffic volume is increased. Are high and the existing system can hold the forecasted traffic hence new designs were proposed based on their capacity.
3. The Intersection is designed for mini roundabout of 4.6 m diameter with a designed capacity of 3797 Pcu/hour. And parking facilities are provided in the power plant area which requires 308 spaces.

### 6.4 Limitations of the Study

The following are the limitations of the present study:

1. The present study is limited to the internal area of the Ramagundam Thermal Power plant and analysed by isolation from the external area.
2. While developing Trip generation model only population and employment variables are considered due to lack of data. However other variables like vehicle ownership etc can be considered.

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