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Speed Limits and Lane System Implementation – Ongole City

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Abstract :: Transportation is considered as nitty-gritty of human life and backbone of national, regional, and local economy. The pavements performance mostly relies on their design. Setting out speed limits and implementation of lanes depending on the category of roads gives the finest design of pavement and also leads to utmost safety of the public. Establishing the intact and acceptable speed limits is crucial and every now and then, it's a challenging responsibility of the transportation agency. The proposed study objective is to provide road safety, reduce the occurrence of speed related fatalities and proper transportation services in Tier III cities (Populations above 2 Lakhs and below 6 Lakhs) of India. For this purpose, an empirical study of vehicle flow; study of various IS codal provisions; accidental analysis is done. The report reviews different road survey's methodologies which are essential for data collection. The review also deals the problems encountered by the public due to irregular traffic conditions. In this detailed project, an attempt is made to propose a road design for Ongole in Andhra Pradesh, based on detailing of the speed limits and lane system of tier III cities.

Keywords — ***Pavement, nitty-gritty, utmost, fatalities, empirical, survey methodologies, lane system, tier III cities.***

I. INTRODUCTION

The present thesis is aforethought to serve as a model for roadway design criteria of Tier III cities of India pertaining to major issues of Speed Limits and Lane System. It is widely accepted that speed is a leading contributor to road accidents. The connection between speed and road accidents and between speed and severity of accidents are well established. In addition to this, provision of lanes is a paramount to regulate and mentor the drivers and also for reduction of traffic conflicts by avoiding the collision of vehicles.

The debut to success is to study and interpret the cognitive function of speed limit determination. The human reasoning is hinged on road sign which gives temporary speed limits in some hazardous or unpredicted situations, like roadwork's or sharp bends. These speed limits are set depending on the category of roads and vehicles.

For mucho human history, lane markings on roads are not needed because most people walked or rode horses at relatively slow speeds. One more reason to avoid lane markings is that, their maintenance is expensive. When automobiles, trucks, and buses came into widespread use during the earlier stages of 20th century, head-on collisions became more common.

Without the provision of guidance by lane markings, drivers in the olden days often made a mistake in favor of keeping closer to the middle of the road, rather than taking risk, going off-road into ditches or trees. This practice often left inadequate room for obstructing traffic by introducing the lane system.

Thus, Ongole, a tier III city of India is selected now-a-days for study, and a detailed road sketch is put forward regarding Speed Limits and Lane System by following the design criterion of tier III cities. In this regard, data is collected relating to traffic flow and accidents; road survey is done based on various survey methodologies. A design norm is finally developed for tier III cities providing Speed Limits and introducing the Lanes wherever necessary.

1.2 PROBLEM STATEMENT

Most of the roads in India are not having any specific and systematic approach for pavement maintenance, leading to wastage of precious time of public and also jeopardize the public safety. In the above context, an organized approach is the need of the hour to prioritize the pavement development activities subject to respective problems that encountered.

1.3 CURRENT THREATS

Ongole, just like some more cities and towns in India, is facing a great challenge in dealing with smooth and sustainable on-road journey of the public. For Speed Limits and Lane Systems in particular, it is sought that many towns and cities aren't giving enough priorities while developing the Road Transportation Systems.

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The following are few current threats that are found:

- Over Speeding of Vehicles
- Rapid Traffic Jam
- Head-On Collisions/Cornfield meet
- Irregular Movement of Vehicles
- Non-Compliance of path guidelines
- Insufficient reaction time for the driver
- Increase in percentage of Accidents by other means
- Unsafe Lane changes

II. LITERATURE REVIEW

Safety is a vital constituent of transportation engineering. The safety of road transportation involves many factors including driver skills, roadway characteristics, vehicle conditions, and weather. The apperception of hazards which increases the severity in the event of crash is important adding to crash causation. Among all contributing elements, speed is considered to be the most critical. Statistics proved that speed is a factor in which one-third of all motor vehicle disasters (**NHTSA, 2002**).

The investigation of Solomon in 1964 about the connection between speed; characteristics of drivers and vehicles; and accidents was based on approximately 600 miles of 2 and 4 lane rural highways. 10,000 number of crash records were reviewed to collect a mixture of data. As an extra, data regarding driver's age, gender, vehicle horsepower etc. was collected through conducting interviews for the drivers. Data was collected over 2 years and **Solomon** developed a U-shaped curve which shows the involvement of accident rate as a part of speed.

National Highway Traffic Safety Administration (NHTSA) reveals that the speed related crashes report over 13000 disasters in a year at United-States, made "speeding" as the most usual contributors for harmful crashes. More frequently used method of managing travel speeds is the **"Posted Speed Limit."** The speed limits which are already set, predates the automobiles about 200 years, when Newport, Rhode Island, prohibited the horses galloping on major through fares to prevent death of pedestrians.

In 1861, English parliament has credited with setting out the world's first speed limit for mechanically-propelled vehicles. At that instant, the Locomotive Act limited the speeds of all locomotives on public highways to 10mph (16km/h) – 5mph (8km/h) through any city, town/ village. The act was later amended to set speeds limits of 4mph (6km/h) outsides of towns and 2mph (3km/h) within them.

A top writer at top developments.com named **Sandra Mc Call** said that lane support system is very beneficial system that assists and warns the driver, when they unintentionally and unwillingly leave the road the lane, or when the driver changes the roadway without any indication. Sometimes, accidentally, the vehicle speeds-up, which is a heavy problem and leads to disasters on some roads. So, a speed alert system is made over to get rid of those situations. This system will assist you to maintain the optimum speed also to avoid any associated traffic crashes. It also tells you the suggested limits of speed and when exceeding those limits.

European (Netherlands and Sweden) research signifies greater endurance of lesser speed limits in urban residential streets, rather than on high speed roads a study of 80 km/h roads of rural areas in Netherlands demonstrated the importance of ensuring road characteristics are a better match for driver's perception of suitable speed limits.

There is an excusable limit of lower speeds on some rural and gravel roads and also on some sealed 2- lane roads of rural areas which is indicated by Australian research.

Studies of **Swedish Road Administration** have shown that, while people often not agreed with lower speeds, an appropriate portion of appellants travelled much slowly in following the changes.

Speed-zone guidelines and manuals from various state DOTs were reviewed, including **Alaska, Kentucky, Massachusetts, Missouri, Connecticut, and Georgia**. A number of other studies were reviewed relating to factors affecting the operating speed, crashes and their severities, the determination of a realistic speed limit, and various speed-reduction techniques.

According to the **Idaho Transportation Department (ITD)**, some transportation professions have cited the design speed as a limiting factor for determining a maximum speed limit (Idaho Transportation Department, 1997). However, determination of speed limits for realistic speed zones should not be associated with the design speeds of the road.

For changes in speed limits, the **Institute of Transportation Engineers (ITE, 1993)** suggested that an unbiased engineering study was needed to examine the following conditions: roadside development, road and shoulder characteristics, pedestrian and bicycle activities, speed limits on adjoining road segments, crash experience or potential, and population density

The literature review focuses on different areas such as: ITS applicability in the developing countries like India with major issue of Traffic congestion, Infrastructure constraints, HighTrafficLoads,NonLane Traffic System etc., There are few research gaps were identified in the field specifically in the areas of ITS and its practical implementation. To fill these gaps and extend previous studies within the field, there is a need for conducting research to investigate the relationship between ITS and its implementing issues. Based on the findings the author highly recommends that the ITS implementation in Indian perspective requires very diverse approach than the developed countries.

A 1986 Institute of Transportation Engineers (ITE) survey of 53 transportation agencies found that 13 of the respondents had used median acceleration lanes. Respondents were split in their opinion regarding the desirability of median acceleration lanes. The ITE concluded that the lanes appear to reduce crashes, promote efficiency in left-turn movements, and reduce conflicts, but insufficient data were available to quantify their safety and operational benefits.

III. DETAILING OF PROJECT OBJECTIVE

The project objective comprises of road safety, Reduction of Speed related fatalities and provision of proper transportation services for tier III cities. These are individually discussed below.

3.1 ROAD SAFETY

The procedures and parts useful to prevent road users from death or serious injury come under road traffic safety. Types of road users involve cyclists, pedestrians, vehicle

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passengers, motorists and passengers of on-road public transport (mainly trucks and buses). The approach of Safe System ensures basic strategy in the act of crash; the brunt energies left under the beginning likely producing either serious injury or death. The threshold varies from one crash scenario to the other, depending on the level of safety offered to the users of road who are involved in it. The perfect instance is dealt here., the survival chances for an unguarded pedestrian stroked by a vehicle dwindle briskly at speeds more than 30 km/h, while for a correctly laid motor vehicle occupant the detracting brunt speed is 50 km/h (for side brunt crashes) and 70 km/h (for cornfield meet).

3.2 REDUCTION OF SPEED RELATED FATALITIES

Main goal is reducing fatal and severe injury traffic crashes in which speeding or inappropriate speed is one factor. As is the case, Strategic Highway Safety Plan of AASHTO, it is effectively addressed that the collisions involves an interdisciplinary approach; a combination of education, enforcement and engineering measures will often be needed to obtain measurable improvements in safety.

Speeding-related fatalities can occur when drivers travelling at speeds clearly in surplus of the appropriate speed. Fatalities can also result when the selected speed is legal, yet local conditions warrant a lower speed. This guide suggests several objectives for forwarding the speeding problem and inappropriate speed choice.

Specific objectives include improvements in procedures for setting out speed limits, driver education programs, speed enforcement programs and engineering features of the lane environment. List of objectives and the concerned plans for severe crashes involve speeding or inappropriate speeds are explained here.

➢ **Set Appropriate Speed Limits**

Fixing speed limits to reflect the neighboring context of the lane meeting with driver's belief helps to improve driver's sense. Inconsistent limits of speed may be forgotten by the drivers in major number leads to negligence with regard to speed and other traffic laws.

➢ **Heighten Driver Awareness of Speeding-Related Safety Issues**

The drivers and other passers-by are informed about the consequences of speed to drive the drivers to follow the limitations of speed and drive at speeds safe for the lane system of roads.

➢ **Improve the Effectiveness of Speed Enforcement Efforts**

Many crashes took place by driver's non-compliance of traffic rules and laws. Speed Enforcement can be increased effectively, if drivers realize the significant chance for speeding and may be given a hefty fine. Drivers' perceptions of the enforcement related risks of speeding can be increased by various enforcement programs such as conducting programs for training classes to drivers, often checking of the speeding of vehicles, imposing heavy fines for repeated offenders by the courts while upholding of citations.

➢ **Communicate Appropriate speeds - Traffic Control Devices**

Information regarding correct speeds, including fixed speed limits, changeable speeds, and unwarranted speeds, must be reached in detail to drivers at appropriate locations. Pavement markings encourage the drivers to go ahead with correct speeds irrespective of speed limit. Even though drivers have the responsibility to go at a safe speed, they could receive cues from the roadway atmosphere as to what that safe speed is.

➢ **Ensure that Roadway Design and Traffic Control Elements Support Appropriate and Safe Speeds**

Driver's expectations for speeds can be gathered from the traffic signals and also the designs of sections and intersections of roads. For example, roadway designs influence the drivers with respect to their choices of appropriate speed. Geometric elements affecting operating speeds, such as different kinds of curves, encourage correct speeds. Designs and types of junctions have to be appropriate for the roadway context. Providing proper signal co-ordination through intersections along a corridor creates uniform speeds and reduces the necessity to stop at the intersections.

3.3 PROVISION OF PROPER TRANSPORTATION SERVICES FOR TIER III CITIES

Intelligent Transportation System (ITS) involves Information and Communication Technology (ICT) interventions used for efficiently managing transportation and also for providing better transportation services. One of the major areas in Intelligent Transportation System which relates this study is as follows.

- **Automated Speed Enforcement**

The new generation automated speed program is very well implemented in other countries. However, in India it has to be effectively enforced. With the congestion and heavy traffic on roads, it is all the more crucial to benefit from the features such as automated red light, auto traffic management, maximum detection range, multiple car tailgating, etc.

IV. METHODOLOGY, ANALYSIS AND RESULTS

The work was categorized into the following steps:

- Study Area Characteristics by Road Survey Methodologies
- Physical Inspection of selected locations
- Gathering Information
- Identification of problems that must be answered
- Proposing Speeds and Lane Provision for various Roads basing on survey and Analysis

The adopted methodology addresses mainly gathering and information analysis of data relating to traffic flow, accidents, lane provision and problems undergone by the people at large due to irregular transportation services. Initially, an inspection is made across various roads of the selected area for getting a complete view of present traffic conditions and intensity of distress in those conditions. Pavement information is gathered basing on the speed limits followed by vehicles on various roads and already provided lane system. Basing on the above steps, a road map is proposed for the selected study area.

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- By adding proposed admixtures the initial cost of the mix may be high, but overall cost on using them in construction will be economical.

4.1 STUDY AREA CHARECTERISTICS BY ROAD SURVEY METHODOLOGIES

4.1.1 Selection of City

Ongole, a small sized city located at about 15.506° N 80.049° E, eastern part of the Prakasam District, Andhra Pradesh, is chosen for present study. Ongole is categorized as Tier III cities of India having a population of 2,02,826 according to 2011 census. This city is connected by road to major destinations. National Highway 16, a part of Golden Quadrilateral highway network which bypasses the city. National Highway 216 connects the city with Kathipudi. City's road length in total measuring as 738.50 km. Said city is having a good connection by rail and road network system with other areas.

4.1.2 CLASSIFICATION OF ROADS IN THE SELECTED CITY

The roads in the city are categorized as follows:

- Expressways
- Arterial Streets
- Sub-Arterial Streets
- Collector Streets
- Local Streets

1. Expressways

The city roads that are meant for vehicle traffic with total or part control access and they are given with grade separation at intersections of road are construed as expressways. These are generally constructed to have direct connection between major points of traffic generation in industrial or commercial or business districts. Through expressways, vehicle traffic is with very high speeds. No loading and unloading of goods can be permitted on these expressways. Passers-by also are unable to cross the expressways.

2. Arterial Streets

The city roads that are meant for traffic, regularly on continuous route are construed as arterial streets. Spacing of arterial Streets is generally less than 15 km in developed commercial centers but it may be 8 km in less important areas. Arterial Roads are categorized as divided highways with controlled access either fully or partially. It is strictly regulated the parking, loading and unloading process. Passers-by are accorded permission to cross the roads at intersections only.

3. Sub-Arterial Streets

The city roads at lower level of travel mobility than arterial streets are construed as sub-arterial streets. Spacing of these roads may differ from 0.5 km in central commercial districts to 3 to 5 km in sub-urban areas. Restriction on loading and unloading is continuous as usual. Passers-by are accorded permission to cross these highways at intersections.

4. Collector Streets

The city roads constructed for collection and distribution of the traffic in local streets as well as to give an access to arterial and sub-arterial streets, are construed as collector streets and their locations are business, industrial and residential areas. Above roads are approachable from the buildings also. There are few restrictions of parking during peak hours.

5. Local Streets

The city roads which provide a way to residential, commercial and other buildings are construed as local streets. The traffic in those streets either starts or ends. Depending upon the importance of adjoining areas, a local lane may be residential, commercial or industrial. Along local streets, passers-by can move freely and park their vehicles without any restriction.

4.1.2.1 VARIOUS ROADS OF ONGOLE TOWN – CATEGORY OF CITY ROADS

Following tabular column shows the particulars of different categories of roads observed in Ongole town by Location Survey.

TABLE: 1 CATEGORY OF ROADS - ONGOLE

S.NO	AREA/ROAD OF ONGOLE	CATEGORY OF ROAD
1	Guntur Road	Arterial
2	Kurnool Road	Arterial
3	Anjaiah Road	Sub-Arterial
4	Mangamur Road	Sub-Arterial
5	Saibaba Temple Road	Sub-Arterial
6	Rajapangal Road	Arterial
7	Governor Road	Collector Street
8	Ongole Railway Station Road	Sub-Arterial
9	MRO Office Road	Collector Street
10	K.P Road	Sub-Arterial
11	Trunk Road	Sub-Arterial
12	Chaitanya Nagar	Local Street
13	Bharat Nagar	Local Street
14	Gopal Nagar	Local Street
15	Kammapalem	Local Street
16	East Christian Palem	Local Street
17	Indurthy Nagar Road	Local Street
18	NTR Colony	Local Street
19	Bandar Road	Collector Street
20	Santhapeta	Collector Street
21	Ramnagar	Local Street
22	Navodaya School Road	Local Street
23	Housing Board Colony	Local Street
24	Bhagyanagar	Collector Street
25	Daravari Thota	Local Street
26	Seetharampuram	Local Street
27	Dibbala Road	Local Street
28	Gandhi Road	Collector Street
29	Ganuga Palem	Local Street

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30	Lambadi Street	Local Street
31	Vuracheruvu	Local Street
32	New Market Road	Collector Street
33	Patti Vari Street	Local Street
34	Vinnakota vari Street	Local Street
35	L.V Subbaiah Street	Local Street
36	Nirmal Nagar	Local Street
37	Rajiv Nagar	Local Street
38	Gaddalagunta	Local Street
39	Mamidipalem	Local Street
40	NGO Colony Main Road	Local Street
41	Chandraiah Nagar Main road	Local Street
42	Sixty Feet Road	Sub-Arterial
43	Venkateswara Nagar Road	Local Street
44	Venkateswara Colony	Local Street
45	Sri Nagar Colony	Local Street
46	Maruti Nagar	Local Street
47	Srinivasa Colony Road	Local Street
48	Sriram Colony	Local Street
49	Virat Nagar Road	Local Street
50	Vasavi Colony	Local Street
51	Samatha Nagar Road	Local Street
52	Azad Nagar road	Local Street
53	Sujatha Nagar	Collector Street
54	Zilla Parishad Colony	Local Street
55	Kotta Donka	Local Street
56	State Bank Colony Road	Local Street
57	Lawyer Pet	Collector Street
58	Balaji Rao Pet	Local Street
59	Taluka Office Street	Local Street
60	Marati Palem	Local Street
61	Miriyala Palem	Collector Street
62	Ranguthota	Local Street
63	Kabadi palem	Local Street
64	Clough Pet	Collector Street
65	Islam Pet	Collector Street
66	Colony Main Road	Local Street
67	Aluri Street	Local Street
68	Godugu Palem	Local Street
69	Enugu Chettu Centre	Collector Street
70	Bandlamitta	Collector Street
71	RTC Bus Stand	Sub-Arterial
72	Rangarayudu Cheruvu	Collector Street
73	VIP Road	Sub-Arterial

4.1.2.2 FIGURES SHOWING ROAD CATEGORIES – ONGOLE

Figure: 1 Kurnool road – Arterial Road

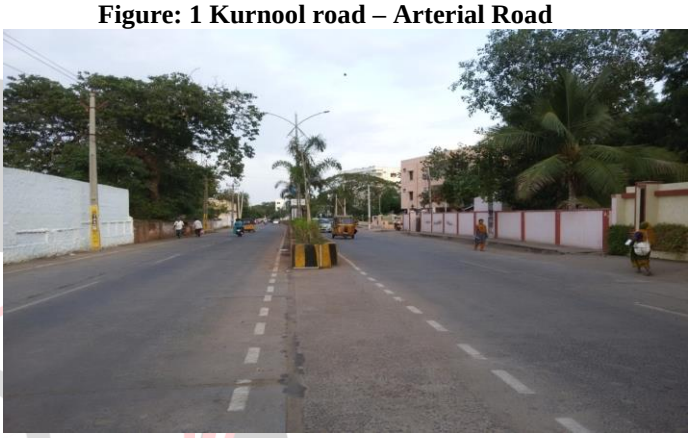

Figure: 2 Railway Station Road – Sub-Arterial Road

Figure: 3 Governor Road – Collector Street

Figure: 4 Gaddalagunta – Local Street

4.1.3 KINDS OF ROAD PATTERNS

Road structure can be laid in various designs. Designs in which the road structure is laid are as follows.

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1) Rectangular or Block pattern
2) Radial or Star and block Pattern
3) Radial or Star and Circular Pattern
4) Radial or Star and Grid Pattern
5) Hexagonal Pattern
6) Minimum Travel Pattern

4.1.3.1 ROAD PATTERN OF SELECTED CITY

The various roads of the selected city, Ongole are divided into rectangular blocks of plots, with intersection of streets at 90º. The major roads passing through the centre of area is wide to one's satisfaction and other subsidiary roads are relatively narrow. The major roads have a direct approach to outside the city. So, we can conclude that the road pattern of Ongole is "Rectangular/Block Pattern." Figure describes an area of Ongole map which depicts the Block Pattern.

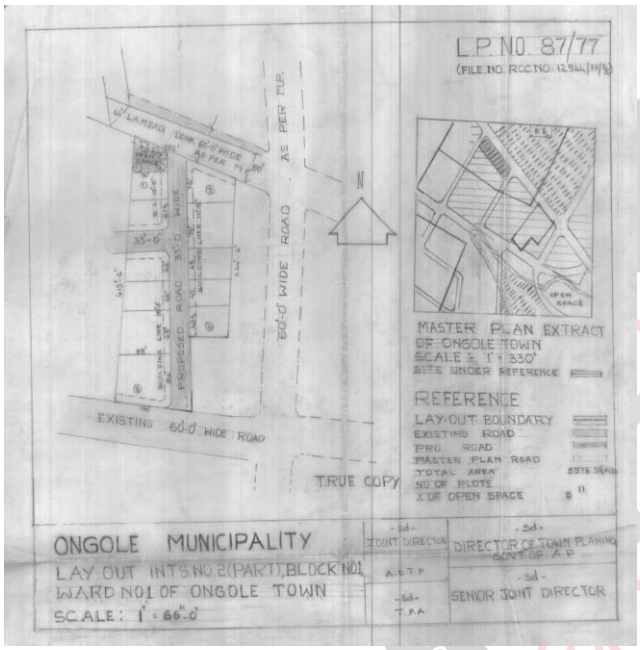

FIGURE: 7 ONGOLE MUNICIPAL CORPORATION MASTER PLAN EXTRACT – RECTANGULAR/BLOCK PATTERN

4.1.4 ROAD SURVEY METHODOLOGIES

People concerned in transport and land-use planning will at some stage be involved with data collection. Even if not directly concerned with the layout and conduct of surveys, they will certainly desire to use data at some time, and at that stage they will realize what should have been done in the design and administration phases of the survey. Surveys are of particular relevance to transit and land-use planning in several specific areas. The intention of survey is, after analysis of the inspection results, predictive models will be derived so as to forecast future transport conditions or to forecast the results of system changes.

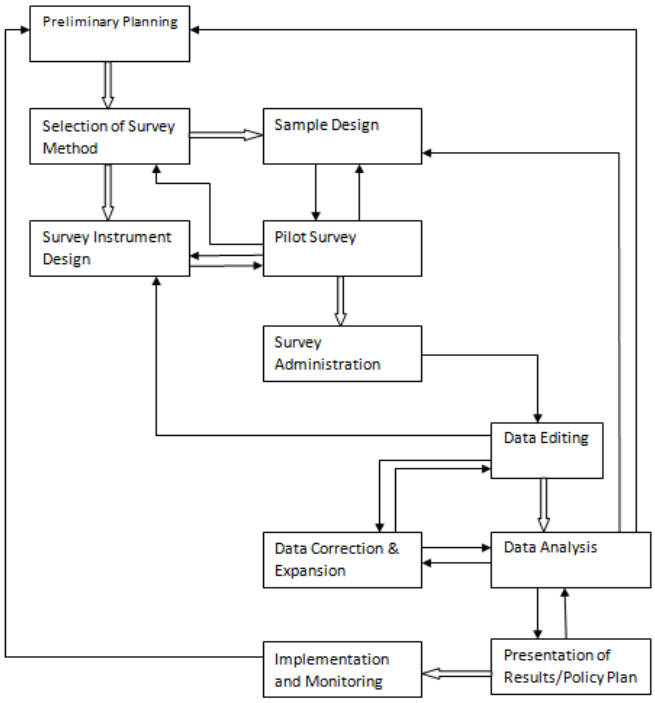

FIGURE: 8 TRANSPORTATION SURVEY PROCESS

- By using the Safety Statistics and Audit Survey Methodology and comparing it with in-depth survey, the accident analysis of Ongole City for the past three years (2015-2017) had been materialized and the collected data is detailed. Refer Appendix A.

TABLE: 2 INFERENCES FROM ACCIDENT ANALYSIS OF ONGOLE

S. No.	Year	No. of Accidents occurred	Type of cause		Major Cause of Accidents	Remedial Measures
			Fatal	Non-Fatal		
1	2015	175	42	133	Over Speeding, Rash and Negligent Driving	By following proper speed limits on various roads and incorporating the lane system at necessary places where the road conditions are suitable.
2	2016	176	28	148		
3	2017 till September	123	22	101		

TABLE:3 RECOMMENDED PCU FACTORS FOR

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VARIOUS TYPES OF VEHICLES ON URBAN ROADS

S.No	Vehicle Type	Equivalent PCU Factors percentage composition of vehicle type in traffic stream	
Fast Vehicles		**5%**	**10% & Above**
1	Two wheelers, Motor cycle or Scooter etc.,	0.5	0.75
2	Passenger car, Pick up van	1.0	1.0
3	Auto-rickshaw	1.2	2.0
4	Light Commercial vehicle	1.4	2.0
5	Truck or Bus	2.2	3.7
6	Agricultural tractor Trailer	4.0	5.0
Slow Vehicles			
7	Cycle	0.4	0.5
8	Cycle rickshaw	1.5	2.0
9	Tongs (Horse drawn vehicle)	1.5	2.0
10	Hand cart	2.0	3.0

TABLE: 4 RECOMMENDED DESIGN SERVICE VOLUMES (PCUs PER HOUR)

S.No	Type of Carriage Way	Total Design Service Volumes for different categories of Urban Roads		
		Arterial	**Sub-arterial**	**Collector**
1	2-Lane (One-Way)	2400	1900	1400
2	2-Lane (Two-Way)	1500	1200	900
3	3-Lane (One-Way)	3600	2900	2200
4	4-Lane Undivided (Two-Way)	3000	2400	1800
5	4-Lane Divided (Two-Way)	3600	2900	-
6	6-Lane Undivided (Two-Way)	4800	3800	-
7	6-Lane Divided (Two-Way)	5400	4300	-
8	8-Lane Divided (Two-Way)	7200	-	-

Arterial – Roads with no frontage access, no standing vehicles and very little cross traffic.
Sub-Arterial – Roads with frontage access but no standing vehicles and high capacity intersections.
Collector – Roads with free frontage access, parked vehicles and heavy cross traffic.

4.3.1.1 TRAFFIC FLOW DATA AND ANALYSIS FOR THE SELECTED CITY – ONGOLE

The hourly change in traffic flow among the roads of Ongole city has two distinct peaks viz., during the peak hours of the day. The peak hour traffic is observed as 8% of the entire daily traffic. During peak hours, unidirectional traffic is also observed on several roads. More percentage of two and three wheelers is observed in the city's busy traffic zones. In-order to avoid confusion of calculating traffic stream characteristics of two-wheelers, three-wheelers, four-wheelers and heavy vehicles and consolidating them, PCU is used to predict the traffic and vehicular capacity. Later on, Design Service Volumes (DSV) is analyzed based on those PCUs for different kinds of roads in the selected city.

TABLE: 5 OBSERVED PCU FACTORS FOR VARIOUS TYPES OF VEHICLES IN ONGOLE

S.No	Vehicle Type	Equivalent PCU Factors percentage composition of vehicle type in traffic stream	
Fast Vehicles		**5%**	**10% & Above**
1	Two wheelers, Motor cycle or Scooter etc.,	0.4	0.75
2	Passenger car, Pick up van	1.0	0.5
3	Auto-rickshaw	1.0	2.0
4	Light Commercial vehicle	0.5	1.0
5	Truck or Bus	2.0	3.0
6	Agricultural tractor Trailer	1.0	2.0

TABLE: 6 OBSERVED DESIGN SERVICEVOLUMES (PCUs PER HOUR)

S.No	Type of Carriage Way	Total Design Service Volumes for different categories of Urban Roads		
		Arterial	**Sub-arterial**	**Collector**
1	2-Lane (One-Way)	2400	1900	1400
2	2-Lane (Two-Way)	1500	1200	900

4.4 ACCIDENTAL ANALYSIS OF ONGOLE

Accidents are the regrettable event which happens in an unexpected and unintentional manner, typically resulting in damage or injury. These are caused because of various reasons. Few of them are delay in the reaction time of the driver (which must be 0.7 to 3 seconds according to Indian standards), irregular movement of pedestrians, head-on collisions, signal breaking, drunk driving, speeding, reckless driving, night driving and design defects of roads.
In Ongole, it is observed and analyzed that the road accidents are less in number by the Survey of Accidents in India. It is clarified from the 2015 census of Road Accidents record that only 10 accidents are occurred in the city. But, it is required to design the roads on a better way in-order to avoid the inconvenience to the public by traffic

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jams, confusion in lane conditions, collisions of speed limits and vehicles to be followed in various roads.

TABLE: 9 PROPOSED SPEED LIMITS

S.No	Category of Road	Speed Limit (kmph)	Class of Vehicle	Maximum Speed Limit(kmph)
1	Arterial Roads	50-80	Light motor vehicle, other than a transport vehicle	No limit
2	Sub-Arterial Roads	40-60	Light motor vehicle, and a transport vehicle;	65
3	Collector Streets	30-55	Motor cycle	50
4	Local Streets	Below 40	Medium or heavy passenger motor vehicle;	65
			Medium or heavy goods vehicle	65
			Heavy goods vehicle or heavy passenger motor vehicle	50

TABLE: 10 PROPOSED LANE SYSTEM-ONGOLE

S.No	Name of Road	Present Condition	Lane Provision	Remarks
1	Kurnool Road (Ext)	Single Lane two-way	Required	It is better to provide this road with a 2-Lane two-way road of minimum 7.0m carriageway width without kerbs because the road is always busy with heavy business vehicles travelling to and fro.
2	Anjaiah Road	Single Lane two-way	Required	It is better to provide this road with a 2-Lane two-way road of minimum 7.0m carriageway width without kerbs because the road is always busy with buses, auto-rickshaws and two-wheelers as it is a school zone and hospital zone.
3	Mangamur Road	Single Lane two-way	Required	It is better to provide this road with a 2-Lane two-way road of minimum 7.0m carriageway width without kerbs because the road is always busy with buses, two-wheelers and auto-rickshaws. Also this is a school zone and business area.
4	VIP Road	Single Lane two-way	Not Required	Because this road mostly connected to residential areas.
5	Rajapangal Road	Single Lane two-way	Required	It is better to provide this road with a 2-Lane two-way road of minimum 7.0m carriageway width without kerbs because the road is always busy with buses, auto-rickshaws and two-wheelers.
6	Governor Road	Single Lane two-way	Not Required	Because this road is enough wider to allocate the vehicle traffic in peak hours also.
7	Trunk Road (Nellore Bus-Stand Area)	2- Lane two-way	Not Required	Because this road is already divided and leads to a peaceful traffic flow including Signaling.
8	Railway Station Road	2- Lane two-way	Not Required	Because this road is already divided and there is no much traffic flow causing interruptions in this road.
9	MRO Office	Single Lane two-way	Required	It is better to provide this road with a 2-Lane two-way

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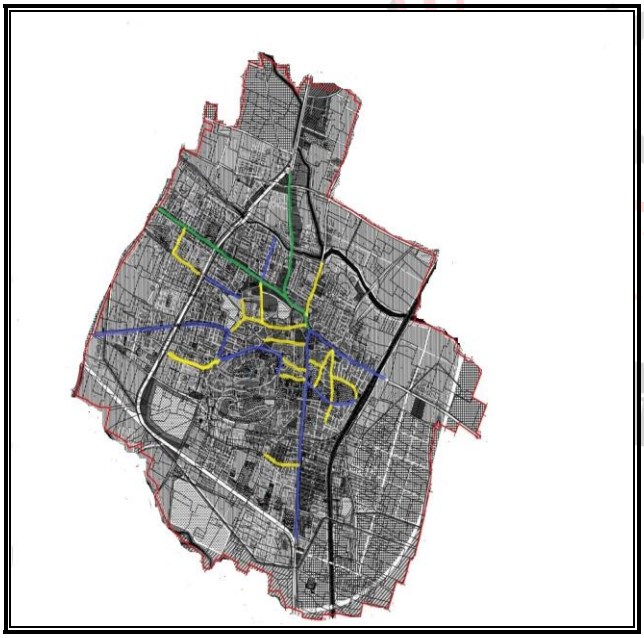
	Road			road of minimum 6.0m carriageway width without kerbs because the road is always busy with buses, two-wheelers and auto-rickshaws.Also this is a recreational and devotional place.
10	Kurnool Road	2- Lane two-way	Not Required	Because this road is already divided and leads to a peaceful traffic flow including Signaling.
11	Guntur Road	2- Lane two-way	Not Required	Because this road is already divided and not much traffic flow causing interruptions in this road.

4.8.3 ROAD MAP – ONGOLE



ARTERIAL SUB-ARTERIAL ROAD
COLLECTOR STREETS LOCAL STREETS
FIGURE: 9 ONGOLE MASTER DEVELOPMENT PLAN –PROPOSAL

The above road map indicates the detailed plan of the selected city, Ongole. Colours are used to show the different categories of roads as Arterial Roads, Sub-Arterial Roads, Collector Streets and Local Streets. These roads follow the speed limits and lane system which are already dealt in the analysis part.

V. CONCLUSIONS

- From the analysis of various surveys collected about road conditions, traffic flow, width requirements of lane, speed limits; accidental rate, all the roads are categorized, segregated and identified accurately.

- This classification routed to setting out Speed Limits and Lane System for various categories of roads and vehicles.

- From road survey methodologies, one and all roads of city are empirically studied pertaining towards lane system and speeds.

- For the problems identified, this report finally provides the present lane conditions and speeds of roads, and proposes proper lane system and speed limits that are ought to be maintained.

- A full-pledged system for determination of effective speed limit on road apropos the human reasoning. Hence, we combine navigation and a vision-based system, leading to better performance.

REFERENCES

[1] Speed management. Paris, OECD/ECMT Transport Research Centre (JTRC), 2006.
[2] Zarean, M., Pisano, P., Dirnberger, K., and Robinson, M., Variable Speed Limit Systems: The-State of-the-Practice. Proceedings of the 1999 Rural Advanced Technology and Transportation Systems Conference, Flagstaff, AZ, 1999.
[3] Edquist R. Rudin-Brown C. Lenne M. Road Design Factors and their Interactions with Speed and Speed Limits. Report 298. Victoria: Monash University Accident Research Centre; 2009.
[4] Murakami, E. (2004). Survey Methods. Transportation Research Circular, Number E-C071, Data for understanding Our Nation's Travel, National Household Travel Survey Conference. The National Academies Keck Center Washington, D.C.: TRB.
[5] Relationship Between Lane Width and Speed Review of Relevant Literature Prepared for the Columbia Pike Street Space Planning Task Force by the Parsons Transportation Group September 2003.
[6] Internet source "pavementmanagement.org," "www.aaae.com," "www.orga.org," "www.tac-atc.ca," "ijprt.org.tw."
[7] Indian Road Congress IRC 1990.
[8] Motor Vehicles Act, 1988
[9] Council, F. M, , and Waller , P. F. "How W i l l the Energy Crisis Affect Highway Safety? " Traffic Safety, v. 74, no. 4, ~~ri.1-1974p, p. 12-:L4, 39-40.
[10] The relationships between speed, speed limits, and motor vehicle accidents by James E. Haney and Kathleen Weber September 1974.
[11] Australasian Transport Research Forum 2013 Proceedings 2 - 4 October 2013, Brisbane, Australia Publication website: http://www.patrec.org/atrf.aspx

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