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Improvement to Village Road Based on Traffic Characteristics

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ABSTRACT
The Improvement of Rural road network is of vital importance for bringing social aminities, education, and health within reasonable reach of villagers for transportation of agricultural products produce from villages to near market centers. There are many habitations in the state of Andhra Pradesh , of which only few habitations are connected by all weather roads. Pavements of roads connecting different villages were initially made up of moorum or other locally available granular materials. Progressively, water bound macadam (WBM) and thin bituminous surfacing were added, depending upon the traffic and availability of funding. The village roads were thus built up stage by stage. No pavement design procedure was adopted for construction of such roads. With increased economic activity, the villages were connected with all-weather roads. And this report will address the improvement of such a village roads and then the development of the district takes place.
Keywords–Habitations,Pavement,Ruralroad,Traffic,WBMroads.

I. INTRODUCTION

The rural roads in India are commonly referred to two types those are namely other district roads and village roads. The physical features of the road play a major role in determining the levels of mobility and safety, particularly for rural roads. Improvements in the infrastructure have the potential to create a safer travel environment. The necessity of a proper road network for the development of the country was understood quite early in India. Srikakulam District, situated within the geographic co-ordinates of 18°-20′ and 19°-10′ N and 83°-50′ and 84°-50′ E, is towards the extreme north east end of the state of Andhra Pradesh in India, with an area of 5837 sqm and a total population of 26.99 Lakhs (as per 2011 census). The district comprises three Revenue divisions - Srikakulam, Tekkali and Palakonda, with 38 Mandals. In vangara mandal mostly contains red soil and mean maximum and minimum temperatures are 42^0C and 28^0C and average annual rainfall is 1328.60 mm. the existing road having gravel surface with fair geomentry so that the improvement should be needed.

II. FIELD WORK

The surveys gives the details about preferred road.

- Traffic Survey and profile leveling carried out.
- Collection of samples from pits adjacent to the existing road.

2.1 Traffic Studies

The traffic volume survey was conducted on the preferred road and the number of vehicles moving on the road was recorded based on the traffic volume count the commercial vehicles were considered in the pavement design. The following table gives the details about the number of commercial vehicles per day at present plying on the road and the estimated number of vehicles that will ply on the road at the end of design life.

Table-1

S.no	from	to	Length (KM)	Present CVPD	Projected CVPD
1	Bhagem peta	arasada	1	60	114

2.2 Profile Survey

A Detailed Survey is carried out to enable drawing of the soil profile. The data during the detailed survey should be elaborate and complete for preparing detailed plans, and design of the project. It is done by means of two type of sections such as 1. Longitudinal sections 2. Cross sections

A longitudinal section is run along a predetermined line such as the centre line of a road. By plotting longitudinal sections; the nature of the ground surface along the proposed alignment may be studied. It determines the relationship between the existing ground surface and the levels of the new work to fix up the proposed work in an economical and safe way. It shows the details such as datum line, existing ground surface and position of drainage crossings. Cross sections are taken during the progress of longitudinal section to obtain a clear knowledge of the undulations of the ground perpendicular to the centre line of the work. The length of cross sections on either side of the centre line varies with the nature of the proposed work at the site. Cross sections should be drawn every 500m.

The horizontal distances are plotted along the horizontal axis to some convenient scale and the distances are also marked. The elevations are plotted along the vertical axis. Each ground point is thus plotted by the two co-ordinates (horizontal distances and vertical elevation). Generally, the horizontal scale is adopted as equality. The vertical scale is not kept the same but is exaggerated so that the inequalities of the ground appear more apparent. The reduced level of points are also written along with the horizontal distances.

2.3 Sub grade Investigation

Basic objective of sub grade investigations is to determine the suitability of existing sub grade to support the pavement in widening portion. The strength and the level of compaction of the existing sub grade were determined by conducting various tests in the field and laboratory.

Figure-1

This is the gravel road being used by the villagers to transport their products.

2.4 Soil classification and tests

The soils were found to be red soils and the soil sample collected from sub grade by digging test pits and the following tests were conducted.

- Grain size analysis and Atterberg's limits were determined in the laboratory for classification of soils
- The Maximum Dry Density and Optimum Moisture Content were determined as per IS 2720 Part 7
- CBR testing was carried out as per IS 2720The samples were compacted at OMC at three heights corresponding to 10, 30 and 65 blows. The samples were soaked for 4 days and the tests were carried out on the soaked samples.

III. DESIGN STANDARDS

3.1 INTRODUCTION

The guidelines prescribed in IRC: SP; 20-2002 are adopted in general. These guidelines are applicable to other district roads and village roads. These roads provide accessibility to the villages in the rural area of the country, Geometric design standards of the rural roads need not be restricted to the minimum set out and milder values than the minimum should be preferred where conditions are favorable and the cost is not excessive. Higher standards in the initial stages may be warranted in cases where improvement of road geometry (like widening of foundation width) at a later date in anticipated due to increased traffic.

3.2 Terrain Classification

The general slope of the country classifies the terrain across the area. The terrain is an important parameter governing the geometric standards and the criteria given in the table below, are used in classifying terrain under these categories. While classifying a terrain, short isolated stretches of varying terrain should not be taken into consideration.

TABLE – 2
Terrain Classification

Terrain Classification	Cross slope of the country	
Plain	0-10	More than 1 in 10
Rolling	10-25	1 in 10 to 1 in 4

The present road project falls under plain terrain and hence all the design parameters have taken pertaining to plain terrain.

3.3 Design Speed

Normally, ruling design speed should be the guiding criterion for the purpose of the geometric design. Minimum design speed may, however, be adopted where site condition and cost does not permit a design based on "Ruling Design Speed".

TABLE-3
Design Speed

Road Classification	Design Speed	
	Plain Terrain	
	Rolling	Min
Rural Roads (VR)	50	40

Hence for the present project a design speed of 50 Kmph is taken.

3.4 Road Land Width

Road land width or right-of-way is the width of land acquired for road purposes. The desirable land width for rural roads in different terrain conditions are given in the following Table.

TABLE-4
Recommended road land width

Road Classification	Plain & Rolling Terrain			
	Open area		Built up area	
	Normal	Range	Normal	Range
Rural Roads(VR)	15	15-25	15	15-20

3.5 Roadway width

Roadway width, which includes parapet, side drains for rural roads for different terrain conditions shall be as per the guidelines given below.

TABLE-5
Roadway width

Terrain Classification	Roadway width (m)
Plain and Rolling	7.5

3.6 Carriage way width

The standard width of carriageway for both plain and rolling as well as in mountainous and steep terrain shall be as per the Table given below.

TABLE-6
Carriageway width

Road Classification	Carriageway width (m)
Rural road (VR)	3.75

The existing carriage way width for the present road project is 3.75 m.

3.7 Shoulder Width

The width of the shoulders for the rural roads in different terrain should be equal to one half of the difference between roadway width and carriageway width.

3.8 Side Slopes

Side slopes for the rural roads where embankment height is less than 3m is given in the Table below.

TABLE-7
Recommended Side slopes

Condition	Slope (H:V)
Embankment - silty/sand/gravelly soil	2:1
Embankment - clay/clayey silt/inundated condition	2½:1 to ½:1
Cutting - silty/sand/gravelly soil	1:1 to ½:1
Cutting - disintegrated rock / conglomerate	½:1to ¼:1
Cutting - soft rock like shale	¼:1 to 1/8:1
Cutting - medium like sand stone, phyllite	1/12:1 to 1/16:1
Cutting - hard rock like quartzite, granite	Near Vertical

3.9 Sight Distance

Visibility is an important requirement for the safety of travel on roads. It is necessary that sight distance of adequate length be available in different situations to provide drivers enough time and distance to control their vehicles so that chances of accidents are minimized. Three types of sight distance are relevant in the design of road geometry; Stopping Sight Distance (SSD), Intermediate Sight Distance (ISD) and Overtaking Sight Distance (OSD).

3.10 Stopping Sight Distance

The stopping sight distance is the clear distance ahead needed by a driver to bring his vehicle to a stop before collision with a stationary object in his path, and is calculated as the sum of braking distance required at the particular speed and the distance traveled by the vehicle during perception and brake reaction time. Based on the design speed of 50 Kmph the stopping sight distance is calculated to be 60 m.

3.11 Intermediate Sight Distance

Intermediate sight distance is defined as twice the stopping sight distance. For the present road project the ISD is 120 m as the SSD is 60 m.

3.12 Overtaking Sight Distance

Overtaking sight distance is the minimum sight distance that should be available to a driver on a two-way road to enable him to overtake another vehicle. The provision of overtaking sight distance is by and large not feasible on hill roads and also not considered for single lane roads. The design values are given in the Table below.

TABLE-8
Design values

Speed Km/h	Design values (m)		
	SSD	ISD	OSD
20	20	40	-
25	25	50	-
30	30	60	-
35	40	80	-
40	45	90	165
50	60	120	235

3.13 Horizontal Curve

Horizontal curve consists of circular portion flanked by spiral transition at both ends. Design speed, super elevation and coefficient of side friction affect the design of circular curves. Length of transition curve is determined on the basis of rate of change of centrifugal acceleration or the rate of change of super elevation.

3.14 Super Elevation

Super elevation is generally considered to counteract only a fixed percentage of the centrifugal force developed, so that the slow moving traffic will be aided.

The value of super elevation, which should not be less than the camber, is restricted to 7%. It is calculated by the following formula.

$e = V^2/225R$

Where e is Super elevation

V is the design speed in Km/h

R is the radius in meters

IV. DISCUSSIONS

Pavement Design : Based on the field work, the traffic studies, reviewing various IRC codes for Flexible pavement design, sub grade CBR and keeping the economics in consideration, the following composition has been suggested for the project under study.

TABLE-9

S.No	Road Length	Present CVPD	CBR	GSB (mm)	WBM (mm)	Surface (mm)
1	KM 0/0 to 1/0	114	3	330	150	2coat SD

V. CONCLUSION

The conclusion From traffic volume survey the commercial vehicle per day has been obtained (114CVPD) from this value we can conclude that there is need for improvement of lane width.

Based on CBR value obtained the thickness of pavement has to be increased. as the existing thickness of pavement do not cater to the volume count of vehicles.

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