

PREPARATION OF DETAILED PROJECT REPORT FOR REDESIGNING SC ROAD AS PER TENDER S.U.R.E GUIDELINES

¹Mr. Vidyadhar patil B, Mr.Kilabanur Pramod, Mr.Madhav P

¹PG Student, ²Assistant professor, ³VP Projects

^{1,2}Department of Highway Technology,
Dayananda Sagar College of Engineering,
Bengaluru, India
³-VP Projects Alcon consultancy,
Bengaluru, India

Abstract- Project Tender S.U.R.E (Specifications for Urban Road Execution) is about getting the urban road right. Every urban road in Bangalore and other cities of India, is an example of the chaos of traffic, broken footpaths, hanging cables, clogged drains, overflowing water, and haphazard street lights, transformers, and telecom fixtures with poor road design and construction result in repeated digging and fixing of the same road over and over again, continuously draining the city's coffers, while doing little to enhance the quality of the road - and thereby the quality of life for all those who use the road. The Government of Karnataka has shown leadership in finally addressing this colossal wastage and poor quality of this most basic mobility infrastructure. Project Tender SURE has been championed in the belief that Tender SURE provides tremendous advantages not just of better roads, but that it is just plain good sense to spend more and spend right, rather than spend even more by spending wrong many times.

The Tender S.U.R.E roads difference is not just the superficial topping as in the past, but a whole new and sustainable approach to designing and implementing urban roads. Based on the principles outlined in the Tender SURE Guidelines. Tender S.U.R.E roads have 3 distinctive aspects a clear focus on pedestrian and cyclist movement consistent traffic and travel lane widths, and the intelligent re-laying of all sub terrain utilities so that there is no more digging up of Tender SURE roads. In addition, wherever possible has been made in the design to include parking spaces and ramped footpaths, street landscaping trees and provide adequate lighting.

The objectives of this study for S C road were to effectively and optimally design the Carriageway in order to have a smooth flow of Vehicular Traffic and pedestrians flow all along the selected stretches. Integrating and streamlining all sub terrain utility lines like power, water, sewerage and OFC under the footpath for purpose easy to maintain and future proofed against road damage.

Key words: Tender S.U.R.E, Bangalore, S C road, sustainable, pedestrian, cyclist, traffic, travel lane and Guidelines.

1. INTRODUCTION

Indian roads are under 5 classifications defined by Ministry of Road Transport and Highway (MoRTH), National highways, state highways, Major District Roads, Other district roads and village roads. Urban roads were not part of the formal classification until the year 2002, when the Ministry of Road Transport and Highway (MoRTH) recognized that the urban roads require distinction and began classifying urban roads separately. However, there is no clear data on the quantum and costs of urban roads since they are clubbed into an aggregate data that includes major district roads and rural roads. This aggregate data that includes major district roads and rural roads. These aggregate accounts for 94% of the total road length. Of this, 50% is paved suggesting that this accounts for the MDR and UR. It is important to understand the share of the urban road component in order to estimate the requirements of city roads accurately. Assuming that MDR are twice the length of state highways, this suggests that urban roads are at least a third of the total which is over a million kms in length. Given the large share of the pie, urban roads have fallen woefully short on attention of both government and market. Government has allocated miniscule infrastructure capital and neglected the need for standards and specifications, while the infrastructure players have displayed neither innovation nor entrepreneurship.

The manuals for roads currently referred to in India mainly pertain to highways and rural roads. The MoRTH standardized the procedure and process for building a road and published the "specifications for road and bridge works" in 1973 that got revised thrice. The later edition is in the year 2001. This is based on a system of road classification, building and maintenance, from a time when India was predominantly rural in nature. The Indian road congress has published a set of guidelines for roads, but these too do not adequately address the requirements for building and managing the urban road network.

Need of Study

Project Tender S.U.R.E. is all about getting the urban road right, about addressing the issues that have made Indian roads so notorious for their chaotic traffic, potholes, broken footpaths, overflowing drainage, poorly placed power transformers and their

hanging, spaghetti tangle of electrical wiring and telecom fixtures. It's about breaking out of the never-ending cycle of temporary fixes that arise from inadequate design and poorly monitored construction efforts. It's about doing away with the ever growing budgetary expenditure on digging and repairing the same roads time and time again whilst never managing to actually enhance the quality of the infrastructure itself, nor the experiences of those who use it. It's about finally taking steps towards addressing the relationship between the quality condition of our streets and the quality of our lives.

Study Area

- Subedar chatram Road, Gandhi nagar, Bengaluru

Scope of Present Study

The roads are to be redesigned as per Tender SURE standards. Tender SURE designs promote hierarchy considering first the pedestrians, second the non-motorised transport, third the public transport users and lastly the motorized vehicles. Tender SURE also recommend involving road side vendors in the design and other necessary amenities like public toilets, arboriculture, etc. Dedicated corridors/lanes will be provided for traffic, services, non-motorised transport and pedestrian. The scope of the Project? Is to provide overlay design for the existing road with the detailed strip plans, junction designs, sections at regular intervals, footpath design, cycle lane design and an estimate of the whole project. As discussed in the above section, 2 roads are identified as part of the core Bangalore area with reasonably good pavement. Hence it was decided to consider these roads only for pavement overlay. Footpath portions will get upgraded, with Non-Motorised cycle lanes, to a world class standard with good, smooth and continuous finish running along next to the footpath. At frequent intervals, landscape is also designed to improve the aesthetics of the roads.

II.OBJECTIVES OF PRESENT STUDY

- Carry out the road inventory and road condition surveys are part of this study to know the existing condition and facilities are provided.
- To ensure that street design is based on scientific assessment of needs and behaviour of street users as observed in the Traffic and pedestrian surveys as part of this study.
- Determine the deflection value of existing pavements by BBD Test.
- To effectively and optimally design the Carriageway in order to have a smooth flow of Vehicular Traffic and pedestrians flow all along the selected stretches.
- Integrating and streamlining all sub terrain utility lines like power, water, sewerage and OFC under the footpath for purpose easy to maintain and future proofed against road damage.
- Detailed estimation and Drawings of two different roads as per tender sure guidelines.

III.EXPERIMENTAL PROGRAMME

Various engineering surveys and investigations that are essential work for the preparation of project work have been carried out along the Project Road section conforming to IRC Specifications/Codes to generate adequate database for preparing the most appropriate and optimal improvement of Roads, widening/strengthening and upgrading the existing road section. All the relevant maps/data/details available with the concerned departments have been collected, compiled and reviewed. Particular attention has been given to past/historical data. All the investigation/surveys have been carried out on a priority basis.

Reconnaissance Survey

Made an in-depth study of the available land width (ROW), topographic survey maps of the project area and other relevant information were collected. A detailed reconnaissance survey was conducted on the total project area and an assessment of possible alignment change at places, if required was also made. Detailed features such as land-use, habitation, water routes, utilities such as electrical lines (HT / LT), etc. were also noted down. This enabled the Consultants to visualize the possible problems likely to be encountered within the execution of the project. The detailed ground reconnaissance of project influence area was utilized for planning and programming the detailed surveys and investigations.

Road Inventory and Road Condition

An inventory of the project road has been carried out by visual observations supplemented with sample measurements using tape, 50 meter wise features like terrain, land-use, pavement surfacing type and width, shoulder surfacing type & width, Subgrade, local soil type, curve details, retaining structures details, location of water bodies, height of embankment or depth of cut, ROW, CD structures, road side arboriculture, existing utility services and general drainage conditions etc., were recorded. The road inventory has been referenced to the existing km posts established along the roadside.

Pavement Structural Evaluation

The Benkelman Beam Deflection studies were carried out as per the procedure suggested by IRC: 81-1997. In each kilometer stretch, deflection observations were recorded along the outer wheel paths. As per the guidelines, the markings on the pavement surface were staggered. A standard truck with a rear axle load of 8170 kg fitted with dual tyres inflated to a pressure of 5.60 kg/cm² is made to stop such that the dual wheels are centered above the selected point.

Topographical Survey

Topographic survey using total station equipment was conducted and a contour map shall be prepared showing contour line drawn at an interval of 0.5m, it also indicate all the prominent existing features such as roads, colonies, (independent houses also), power lines, water bodies, farms, gardens, fields etc. Few reference stones were marked on the survey map and their levels were enlisted (smaller to larger scales). Providing and fixing of boundary stones at an intervals of 50m.

Traffic Surveys

Estimation of traffic over the project corridor is an essential step towards establishing the project viability, the objective was to assess the prevailing traffic characteristics. This includes conducting field traffic surveys, data analysis and estimation of local traffic. The present traffic surveys have been planned in a way to obtain all the necessary information and data deemed necessary for development of the project.

The basis for identification of traffic survey locations is the previous traffic count posts and Consultant's field reconnaissance surveys. To establish the traffic flow characteristics and travel pattern on the corridor, the following surveys were conducted at different locations of project road Traffic Volume Count Survey for Seasonal condition.

Existing Parking Capacity Survey

A parking survey must be carried out on throughout in the Study Area to identify parking patterns and occupancy rates. Parking demand should be established by a manual count, classified by vehicle type. The count should cover either side of the Study Area streets.. The survey should cover on-street parking areas.

Pedestrian Survey

Surveys shall be carried out to assess non-motorized transport (NMT) user flows at important locations in the study area. The survey shall be 24 hours on a normal working day, Recorded the number of pedestrians on both side of the roads.

Planning and design

The pavement design includes Overlay design of the existing pavement Benkelman Beam Deflection Test Results and Pavement Condition Survey data as well as close reconnaissance by experts were used to determine the strengthening requirement of existing pavement. The thickness of overlay was proposed judiciously considering the provisions of IRC: 81-1997.

Based on Design wheel load, Grade of Concrete, Traffic Intensity, Thin White topping overlay has been designed as per IRC: SP: 76-2015.

Cost Estimates

Cost estimation is important for the feasibility study as it provides vital input to the economic and financial evaluation of the project. The cost estimates have been prepared the project corridor separately for improvements to the existing road including reconstruction/widening of few cross drainage structures, longitudinal drains, etc.

Estimation of Preliminary cost, a primary pre-requisite for Economic and Financial evaluation, has been carried out. The process involved in the preliminary cost estimation has been described under the following sections. The rate of materials adopted in the preliminary cost estimate is based on the basic rates of PW, P & IWT D S.O.R. (Bengaluru Circle). For items where these rates are not available, the rates were adopted as per Market rates.

Working drawings

Civil 3D drawings are to be carrying out for the selected roads based on the above details and as per tender SURE guidelines. The different drawings are as follow

- Cross sections
- Longitudinal sections

IV.ANALYSIS AND REDESIGN OF ROADS

Road Inventory and Condition Survey

Table 1 Road inventory survey of Subedar Chatram road

Sl. No.	Chainage		Terrain (Plain/Rolling)	Land Use (Built Up/Barren/Agri)	Carriageway		Drainage,LHS			Drainage,RHS		
	From (m)	To (m)			Type (BT/CC/GR/ER)	Width (m)	Type	Condition (G/F/P/V/P)	Width (m)	Type	Condition (G/F/P/V/P)	Width (m)
1	0	50	Plain	Built Up Area	BT	14.0	CC	P	1.2	SSM	P	1.5
2	50	100	Plain	Built Up Area	BT	14.0	CC	P	1.2	SSM	P	1.5
3	100	150	Plain	Built Up Area	BT	14.0	SSM	P	1.5	SSM	P	1.5
4	150	200	Plain	Built Up Area	BT	14.0	SSM	P	1.5	SSM	P	1.5
5	200	250	Plain	Built Up Area	BT	14.0	SSM	P	1.5	SSM	P	1.5
6	250	300	Plain	Built Up Area	BT	14.0	SSM	P	1.5	SSM	P	1.5
7	300	350	Plain	Built Up Area	BT	13.0	SSM	P	1.5	SSM	P	1.5
8	350	400	Plain	Built Up Area	BT	13.5	SSM	P	1.5	SSM	P	1.5
9	400	450	Plain	Built Up Area	BT	13.5	SS	P	1.5	SS	P	1.5

		0					M			M		
10	450	500	Plain	Built Up Area	BT	13.5	SSM	P	1.5	SSM	P	1.5
11	500	550	Plain	Built Up Area	BT	13.5	SSM	P	1.5	SSM	P	1.5
12	550	592	Plain	Built Up Area	BT	13.5	SSM	P	1.5	SSM	P	1.5

Table 2 Pavement condition survey of Subedar Chatram road

SL No.	Chainage		Pavement Composition		Pavement condition	Road side Drain & Condition		Footpath		Kerbs	
	From (m)	TO (m)	Composition	Type		Good/ Fair/ Poor/ Very poor	LHS	RHS	LHS	RHS	LHS
1	0	50	Surface Binder	Asphalt	Poor	CC	SSM	Tiles, PCS	CC,PCS	Present	Present
2	50	100	Surface Binder	Asphalt	Fair	CC	SSM	Tiles, PCS	PCS	Present	Present
3	100	150	Surface Binder	Asphalt	Fair	-	SSM	Tiles, CC	PCS,CC	Present	Present
4	150	200	Surface Binder	Asphalt	Fair	-	SSM	Tiles, CC	Tiles,CC, PCS	Present	Present
5	200	250	Surface Binder	Asphalt	Fair	SSM	SSM	PCS,CC	BS,Tiles	Present	Present
6	250	300	Surface Binder	Asphalt	Fair	SSM	SSM	PCS,CC	BS,CC	Present	Present
7	300	350	Surface Binder	Asphalt	Fair	SSM	SSM	CC,Tiles, PCS	BS,CC,Tiles	Present	Present
8	350	400	Surface Binder	Asphalt	Fair	SSM	SSM	PCS	BS	Present	Present
9	400	450	Surface Binder	Asphalt	Fair	SSM	SSM	PCS	PCS,BS	Present	Present
10	450	500	Surface Binder	Asphalt	Fair	SSM	SSM	PCS,CCPB	PCS	Present	Present
11	500	550	Surface Binder	Asphalt	Fair	SSM	SSM	PCS,CCPB	PCS,CC	Present	Present
12	550	600	Surface Binder	Asphalt	Fair	SSM	SSM	PCS,CCPB	PCS,CC	Present	Present

Travel lanes do not follow constant width along the road network or even the individual roads. Width of the lane does not remain constant and varies throughout the section.. The travel lanes width and type of surface for every 50m length is shown in the table.

The footpath on these two road network are paved with interlocking blocks, tiles, cover slabs over drains (itself as footpath) and at some places concreted. Along the road corridor section, the footpaths are damaged or settled due to leakage of water / sewage lines etc. Manholes are not in same line and grade with the footpath surface, and hence effective width of footpath is reduced at certain locations for safe pedestrian movement. There are many obstructions on the footpath which shortens the effective usable pedestrian area on the path. Therefore the un-uniformity in footpath has forced pedestrians to find their way wherever possible and hence they have started moving on the carriageway which directly or indirectly affects the traffic leading to congestion. Accessibility of these footpaths was not kept in mind while laying them. At some places the paving itself is not done.

Width of footpath varies on each road as listed in the table below. There are obstructions for pedestrians which occur often on the footpath. These obstructions are either electrical power box or transformer or manholes opened up or service, condition of drainage, Light Poles, Sign Boards and other things are mentioned in the above tables.

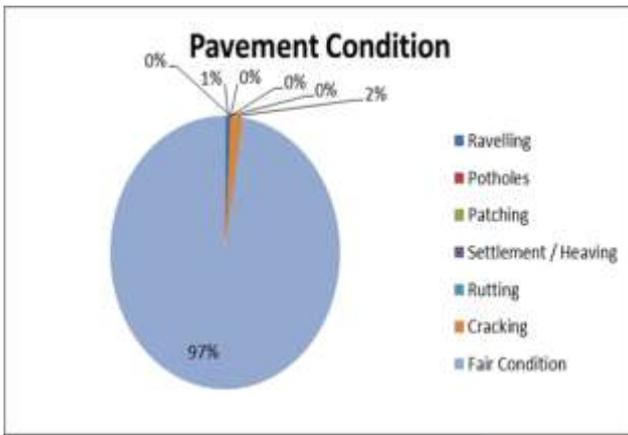


Fig 1 Graph showing Road condition of S C road Hanumanthappa road

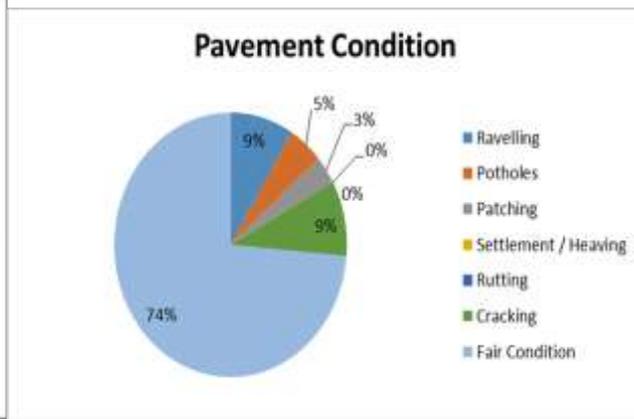


Fig 2 Graph showing Road condition of W H Hanumanthappa road

Rebound Deflection Studies

Rebound deflection study was conducted to assess the present structural adequacy of the pavement by conducting Benkelman Beam Deflection studies. The study was conducted for structural evaluation of the existing flexible pavement and for the design of overlays required for the strengthening of the pavements. During the inspection of the road, it was found that the pavement surface to be fair to good by visual observations. Benkelman beam rebound deflection study was carried out on both roads of the study stretches. Corrected Characteristic Deflection of S C road was 2.054.

Table 3 BBD test of W H Hanumanthappa road

Station	Dial Gauge Reading			Rebound Deflection D	Pave ment Tem p.	Temperatu re Correction Factor	Temperatu re Corrected Deflection Dr	Subgrade PI	Field Moistu re	Season al Correction Factor	Moisture Corrected Deflection Dm	Mean Deflectio n /km	Standard Deviation	Corrected Characteristic Deflection
	Do	Di	Df									Mean	S.D	
(Km)	(Dix)	(Dix)	(Dix)	(mm)	(°C)		(mm)	(%)	(%)		(mm)	(mm)	(mm)	(mm)
0.000	100	45	43	1.14	29	0.06	1.20	8.00	5.85	1.533	1.84	1.835	0.110	2.054
0.050	100	42	40	1.20	29	0.06	1.26	8.00	5.85	1.533	1.93			
0.100	100	48	46	1.08	29	0.06	1.14	8.00	5.85	1.533	1.75			
0.150	100	46	44	1.12	29	0.06	1.18	8.00	5.85	1.533	1.81			
0.200	100	41	39	1.22	29	0.06	1.28	8.00	5.85	1.533	1.96			
0.250	100	49	47	1.06	29	0.06	1.12	8.00	5.85	1.533	1.72			
0.300	100	50	48	1.04	29	0.06	1.10	8.00	5.85	1.533	1.69			
0.350	100	44	42	1.16	29	0.06	1.22	8.00	5.85	1.533	1.87			
0.400	100	42	40	1.20	29	0.06	1.26	8.00	5.85	1.533	1.93			
0.450	100	48	46	1.08	29	0.06	1.14	8.00	5.85	1.533	1.75			
0.500	100	50	48	1.04	29	0.06	1.10	8.00	5.85	1.533	1.69			
0.550	100	42	40	1.20	29	0.06	1.26	8.00	5.85	1.533	1.93			
0.592	100	40	38	1.24	29	0.06	1.30	8.00	5.85	1.533	1.99			

Traffic Survey

Traffic Volume in Bangalore is rising exponentially. In last decade, RTO have registered around 24 Lac vehicle. A total of approximately 40 Lac vehicles including floating vehicles are operating on CBD road network a study conducted by RITES in 2006-07 & Bangalore Traffic Police webpages categorically acknowledge that all of these core roads are operating above their capacities.

However, in order to design the pavement thickness, commercial vehicles operating (CVPD) counts were carried out. For this task, traffic c obtained from Bangalore Traffic Police. Data captured on a busy Wednesday which is middle of the week from morning 8 AM to next day 8 AM and these 24 hrs traffic data were copied on a hard disk for all nine junctions in the study area. The results are detailed in Tables. Both roads selected in this report, are more than of its capacity. On both roads, traffic moves with a speed of 10- 15kmph during peak hours.

Table 4 PCU values of Subedar Chatram road

Particulars	Two Wheeler	Auto	Car/Jeep/Van/Taxi	Mini	Bus	LCV	Trucks			Agricultural Tractor		Cycles	Cycle Rickshaw	Bullock Cart	Horse	
						Goods	2-Axle	3-Axle	Multi Axle	With Trailer	Without Trailer					
PCU(day 1)	0.5	1	1	3	3	1.5	3	3	4.5	1.5	4	0.5	2	6	4	
Total(Normal)	5195	3919	1716	49	398	311	52	3	0	0	0	0	0	0	0	11643
Total(PCU)	2597.5	3919	1716	147	1194	467	156	9	0	0	0	0	0	0	0	10205
PCU(day 2)																
Total(Normal)	10597	6245	7632	134	468	220	88	2	0	0	0	0	0	0	0	25386
Total(PCU)	5298.5	6245	7632	402	1404	330	264	6	0	0	0	0	0	0	0	21582
PCU(day 3)																
Total(Normal)	6175	4216	5228	35	153	190	59	0	0	0	0	0	0	0	0	16056
Total(PCU)	3087.5	4216	5228	105	459	285	177	0	0	0	0	0	0	0	0	13558

Pedestrian Survey

By keeping the increase in pedestrian movement in future the width of footpath is increased from width of 1.5m to 2.0m -3.5m entire stretch of both roads. Heavy duty Interlocking Paver Blocks of 80mm thick are been proposed for the footpath portion for movement of pedestrians. HDPE lines of 4 numbers of 200mm dia and 4 numbers of 100mm dia pipes on both sides of the road are provided to carry the utility lines such as BESCO lines and OFC cables. Also dual cross ducts of 300mm dia at every 100m interval is provided in order to cross over the utility lines with cross duct chamber of 2.0m x 1.0m is provided on both side of the roads.

Table 5 Pedestrian survey of Subedar Chatram road

TIME in Hours	No. of Pedestrians	
	LHS	RHS
7 AM to 8 AM	260	455
8 AM to 9 AM	590	890
9 AM to 10 AM	780	1365
10 AM to 11 AM	895	1520
11 AM to 12 PM	815	1435
12 PM to 1 PM	725	1250
1 PM to 2 PM	650	1235
2 PM to 3 PM	610	1160
3 PM to 4 PM	795	1470
4 PM to 5 PM	910	1690
5 PM to 6 PM	1110	1870
6 PM to 7 PM	1305	1835
7 PM to 8 PM	1365	2010
8 PM to 9 PM	1290	2165
Total	11840	19895

Abstract

The basic rates for each construction items were analyzed on the basis of MORTH Standard Data Book and Karnataka PW,P&IWD Standard Schedule of Rates 2016-17 of Bengaluru Circle adopted. The quantification of most of the items that are uniformly occurring is calculated per km, based on the typical cross sections. The construction items covered in cost estimates are: site clearance; earthwork cutting, Loosening and recomposing, Pavement in carriageways and shoulders; culverts; Drainage and Miscellaneous items which includes Pavement markings, Signage's, Guard Rails, etc. Special consideration was given for the stretches passing through hazardous conditions. Abstract of resultant estimated costs of improvement of roads, culverts, Drains, etc. are presented in below Table.

Table 6 Abstract of S C road

Sl. No.	Description of Work	Amount in Rs.
1	Cost of Dismantling work (Road Portion)	510,189.19
2	Road Formation (Base, White topping/Rigid and Surface Coarses)	11,697,631.40
3	Footpath, Kerbs, L-Kerb, Bollards & Dust Bins	12,773,369.20
4	Traffic Signs, Markings and Other Road Appurtenances	1,740,881.98

5	Utility Lines, Power Cross Over Chambers, Sewer Chamber, SWD Chamber & Chute Drains	27,034,116.65
6	Dismantling Work (Footpath, Side Drains & Pre Cast Slabs)	615,357.90
7	Removal of Unserviceable soil, Loading, unloading and Cost of Haulage	1,751,567.86
8	Street Lighting works	1,991,463.56
	Construction Cost	58,114,577.75
9	Incidental shifting of BESCOM utilities (2% of Project Cost)	1,162,292.00
10	Preparation of PMC Charges at 2%	1,162,292.00
11	Quality Control Charges at 2%	1,162,292.00
12	DPR Charges	1,250,000.00
	SUB TOTAL	62,851,453.75
	Miscellaneous & unforeseen charges at 10%	6,148,546.25
	GRAND TOTAL	69,000,000.00

Cross Sectional Elements –Drawings

The cross sectional elements are to be detailed as per the material specification and the dimensions are described in the drawings with reference to Tender SURE. The elements include travel lane, cycle lane, footpath, Kerbs, streetlight, storm water pipes, water supply HDPE pipes, Electric lines, OFC lines, Cables for Streetlight, Traffic Signals, SurSigns & Signage, Cross ducts and Road Markings. Since the scope of work is only the overlay designs the material and finishes are important to be of given specification so as to sustain the load over it and also give an appealing look with the urban design standards. Standards in terms of dimensions are mentioned in the "Design standards for roads" from tender SURE guidelines and materials are site specific and subjective to these elements. The material palette chosen for both roads.

Table 7 Material palette chosen for both roads

Sl. No	Particular	Materials	Remarks
1	Travel lane	White topping overlay	90mm
3	footpath	Shot Blasted interlocking tile	60mm
4	Kerbs	RCC Half-battered	220mm height
5	Streetlight	LED	8m Height
6	side drain	NP3	900mm Dia. pipe
7	Water supply	MS	300mm Dia. pipe
8	Power	HDPE	3*160mm Dia. pipe
9	OFC	HDPE	2*200mm Dia. pipe
10	Gas	HDPE	20mm Dia. pipe
11	Sewer	NP3	300mm Dia. pipe
12	Cables	HDPE	100mm Dia. pipe
13	Manholes	FRP manholes	

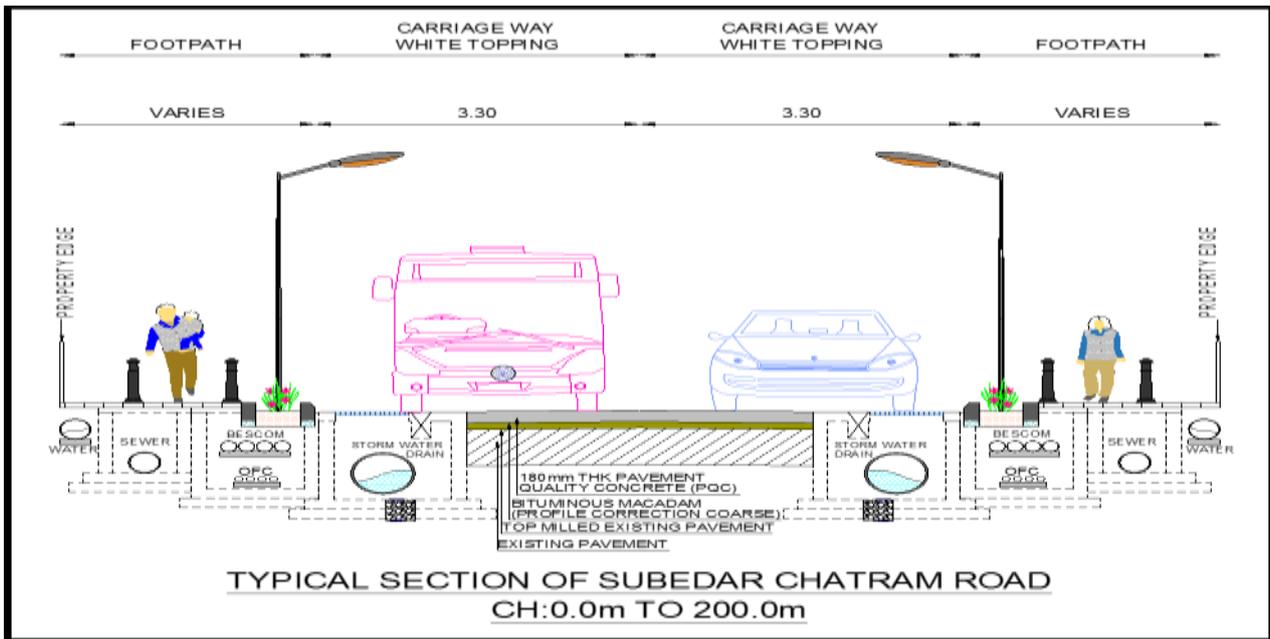


Fig 3 Typical section of Subedar Chatram road

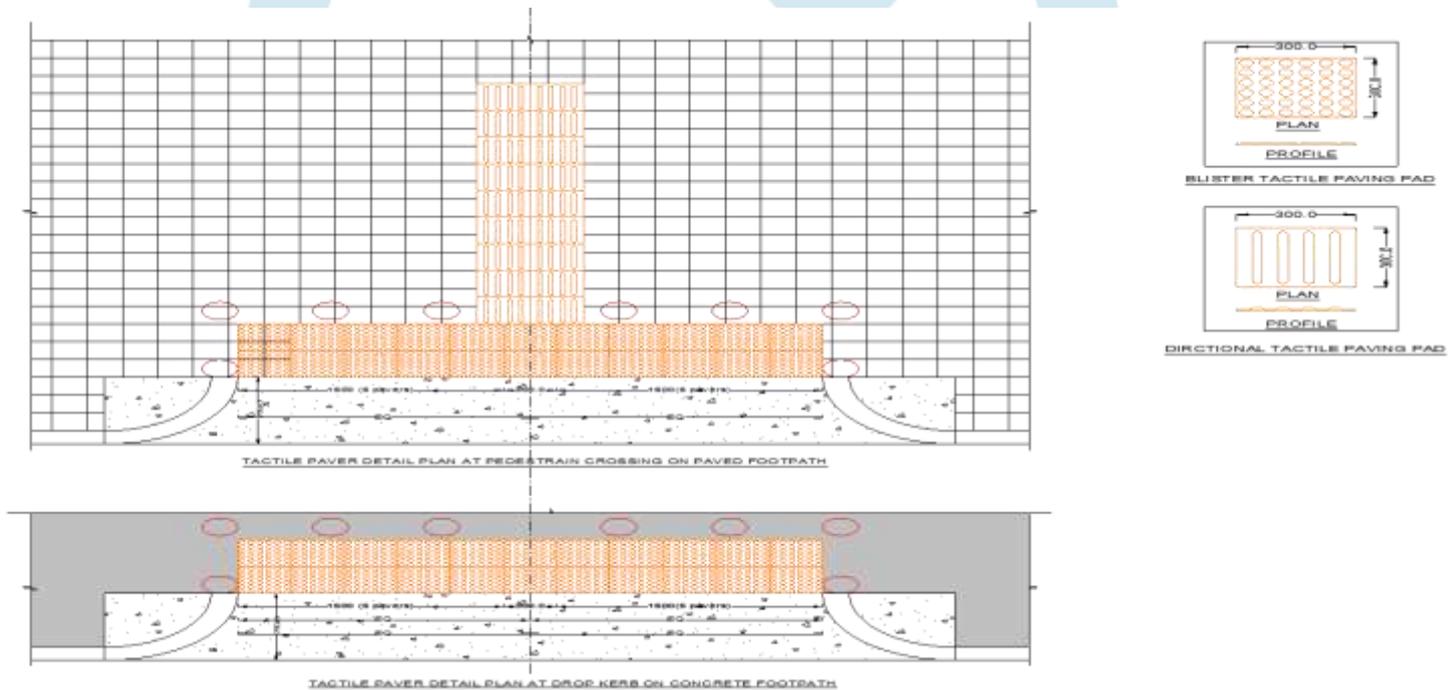


Fig 4 Typical sections of tactile paver details at pedestrian crossing

V.CONCLUDING REMARKS

In the present dissertation study, the road is taken up for research work are S C road road in Gandhi nagar Bangalore near kempegowda bus station. Project Tender S.U.R.E (Specifications for Urban Road Execution is about getting the urban road right. Every urban road in Bangalore and other cities of India, is an example of the chaos of traffic, broken footpaths, hanging cables, clogged drains, overflowing wage, and haphazard street lights, transformers, and telecom fixes with poor design and construction result in repeated digging and fixing of the same road over and over again, continuously draining the city's coffers, while doing little to enhance the quality of the road - and thereby the quality of life for all those who use the road. The Government of Karnataka has shown leadership in finally addressing this colossal wastage and poor quality of this most basic mobility infra road.A total length of 1.219 km of existing road is been designed to be overplayed using thin white topping using Pavement Quality Concrete as per IRC: SP: 76-2015, a thin white topping of 180mm thick is provided as overlay over existing bituminous surface.

- Tender SURE guidelines provides tremendous advantages not just of better roads, but that is just good financial sense to spend more and spend right, rather than spend even more by spending wrong many times.

- 3 distinctive aspects of constructions of roads by tender SURE guidelines are pedestrian and vehicle uniform movement and safety for road users in S C road.
- S C road redesigned with a uniform vehicular travel lane that allows for continuous traffic movement with designated on street parking.
- By keeping the increase in pedestrian movement in future the width of footpath is increased from width of 1.5m to 2.0m -3.5m entire stretch.
- Space provided for the on street parking is increased up to 30 to 35% of existing parking facility.
- Cost of construction of tender SURE roads is expensive but life span of every elements of roads will increase up to 5 times.
- Integrated and streamlined all sub terrain utility lines –water sewerage OFC and telecom, gas, street light wiring, such that they are easy to maintain and future proofed against road damage.
- Ensured in design a network of storm water drain for rainwater overflow that will not pool on road surface and is easy to maintain.
- The safety measures included hazard markings, signage for particulars. Existing roads do not have proper hazard or diversion markings.
- The design also included that increase street landscaping trees, provide adequate lighting and ramped footpaths/driveways.

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