Design of Flexible Pavement District Road

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Abstract – **This document gives formatting instructions for authors preparing papers for publication in IJSRET. The authors must follow the instructions given in the document for the papers to be published. You can use this document as both an instruction set and as a template into which you can type your own text. The body of abstract immediately follows abstract heading in the same paragraph. For example, this paragraph begins with abstract heading. In nowadays it is very important to have a proper road network for the purpose of good transportation. Few places road network is not available while the traffic is higher and enough. Pavementis generally being constructed and used for the purpose of smooth and comfort moment of the traffic.Flexible pavements will be subjected to load by wheel develop stress particles-to-particles transmit to the lower grades of layers through the granular structure. The pavement is subjected to the wheel loading action on it and the load is to be distributed to a larger area, such that the decrease in stress will occur with respect to the depth. The patch considered in this project is of KKY District Road. [KKY-Karimnagar Kamareddy Yellareddy]. The current condition of the KKY road is very much disturbed with the presence of uneven undulations as heavy loaded vehicles like moment of trucks took part. Hence, for the purpose of the fulfilment of all the above requirement factors and for the comfort moment of traffic. Adopted the effective design of flexible pavement. In this paper, we are enclosing thedesign report KKY road which includes all the which comes under the project of the pavement construction.**

Keywords – **[KKY-Karimnagar Kamareddy Yellareddy]**

I. INTRODUCTION

Flexible pavement by CBR Method is consists of processed materials of super imposed layers, which areabove the soil sub-grade. The main objective of this road is to transfer the vehicular load to the lower layers.The purpose of pavement to provide adequate skidresistance, require surface riding quality, less- noise pollution and more reflecting character. The ultimate function of the pavement structure to reduce the transmitted stresses due to wheel, different layers, theirstructure functions loads, by this process bearing capacity of the subgrade will not be exceed. There are two general types of pavement, one is Flexible Pavement other one is Rigid Pavement. In this project we found an overview of types of pavements and failureof pavements. Improper pavement design leads to pavement failure, which affects the riding quality.

II.LITERATURE REVIEW

Designing flexible pavements including cross drainage works of a village road near suburb of Bhuneshwar Tharun Kumar Lohan subesis pati and Prasanta Kumar parida(2019) Connecting road designed and estimated at the least price providing thelocalized material for the sub-grade which is morrum in nature from the traffic value survey the commercialvehicle per day has been obtained. Most part to conclude that a safe and durable road with culverts have been designed taking all the technical specifications into consideration. Flexible pavement for NH-7 of Nagpur-Hyderabad(123km to 175km)- CH .Balakrishna , M .Anvesh kumar. The designed is carried out by the overall traffic summed up to the endof the day. "Flexible pavement design usingIndustrial waste Vishal Mathematic , Vishwanath Awati," Assistant professor ,Dept of Civil Engineering , JCE, Belagavi In this project we used fly ash as a soil stabilizing material with alternative material as cement. Design of Journal of Core Engineering and Management (IJCEM)-2 May 2016 By Ritu Shingloo.Subagio (2005) discuss multilayer pavement l analysisof structure using equivalent thickness method. A method has developed to estimate the stresses and strains in multiple layers pavement system. Construction of flexible pavements by RIYANTO (1996) was pavement using asphalts as a surface. Defects inflexible pavement and its maintenance by "Zulfiqar Bin Rashid" and "Rakesh Gupta". J.M Sadeghi et.al (2007) "Deterioration analysis of flexiblepavement construction a isimportent for the safety of vehicle movement. N. Jain "vehicle axle loading pattern on state roads of Uttar Pradesh". (2009). R. B.Mallick, et.al, "use of empirical roads design software(2006).

III.METHODOLOGY

Alignment of the road is done by road surveying and details are mentioned in the report. Technical featuresof the project such as details of right of the way, No. of lanes, carriageway width, shoulder width are clearlymentioned according to the design of the pavement. All the required dimensions of the cross sectional elements of the road are calculated and mentioned accordingly. Traffic survey report on KKY road is made through manual counting of the traffic momentsof the road. And a design period of 20 years is assumed based on the design data. Tests are to be conducted on bitumen, aggregates and sub soil for thepavement in the near by treatment plant and results been calculated. Finally design data of

the road the KKY road is calculated and design procedure is mentioned. A complete report on KKY road is enclosed in this project.

IV. NECESSITY OF A PAVEMENT

An ideal pavement should satisfy the followingrequirements:
➢ Thickness should be sufficient for distributingthe stresses of wheel load on the sub-grade soil to a safe value.
➢ It should be strong structurally to withstandall types of stresses subjected upon it
➢ Friction coefficient must be adequate to avoidskidding of vehicles
➢ Surface to be smooth for the comfortable provision of road to the users often at highspeed
➢ Impervious surface, so that sub-grade soil iswell protected
➢ It should have a design life with long period atminimum maintenance cost.

Advantages of flexible pavement

➢ It provides the possibility of low cost typeconstruction. It will have a greater resistance to fluctuationsof temperature. Repair works can be conducted easily for the flexible pavement.
➢ The thickness of the road can be easilyincreased according to the convenience.
➢ Less wear to the tire and less fuel consumption and smoother ride .Materials areinexpensive. It duration time is short. Resistsice glaze formation.

Technical features of the project
• Project Right of way = 18.5m, No. of lanes= 2
• Carriageway width = 7m, Divider width = .5m
• Shoulder width = 1.5m

Pavement details
Main Carriageway:
• Bituminous Concrete (BC) = 45mm (becomes35mm after compaction)
• Dense Bituminous Macadam = 75mm(becomes 60mm after compaction)
• Wet Mix Macadam (WMM) = 250 mm
• Granular Sub-Base (GSB) = 250mm
• Sub-Grade (SG) = 1000mm (Gravel—500mm)

Project road and approved department
The Road of Karimnagar Kamareddy Yella Reddy(KKY) which is reach from KM 72/8 to 102/0 havebeen awarded to the following

Location plan of the project
There are mainly two types of pavements, Flexible Pavement ,Rigid Pavement .The Pavements which areflexible in their structural action and have minimum flexural strength under the loads, such pavements are called as Flexible Pavements.where as The Pavementswhich do not have flexural strength and the stresses arenot transferred to the lower layers. Rigid Pavements are constructed by Portland cement concrete or plain concrete . About 40 kg/cm^2 flexural stresses is taken by plain cement concrete slab. Slab action can be seenin Rigid Pavements and it has capability of transmitting heavy stresses of wheel loadwith a wider area. The study area has following details shown in figure 1 and details as given as From 97/4 NH (national highway) to 99/4 total lengthof 2km under permission authority of Roads & Buildings (R&B) Sub-Division, Kamareddy, Telangana state, India.
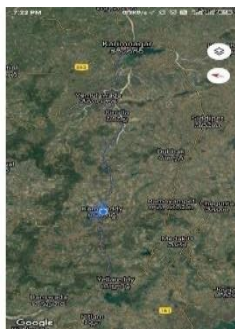

Fig.1 KKY ROAD (Google source)

Functions of flexible pavement
Components are Soil Sub grade, Sub-Base, Course, Base Course, and Wearing Course. Soil sub grade is a large naturally obtained soil, provided to receive thedifferent layers of materials for the pavement to laid over it. Subgrade is the lower

most layer which ultimately receives the whole load of the pavement. The pressure is transmitted on the top most layer of thesubgrade and must satisfy the limit of allowance, suchthat there will be no excess stress condition or any deformations beyond the limit of elasticity. It is very vital to compute the strength properties of the sub – grade soil. This helps in designing the structure for a great strength with the suitable values. Sub base is a course provided under the base course. The principle of Sub-base course is to attain the structural support, drainage improvement, and to minimize the fine intrusion from the sub grade in the structure of pavement. The thickness of sub base course is 20cm. The base course is the layer of material which isprovided under the binder course and it provides additional load to the sub-surface drainage. Base course is a mixer of crushed stone, crushed slag and other untreated materials. Wearing course purpose is to maintain
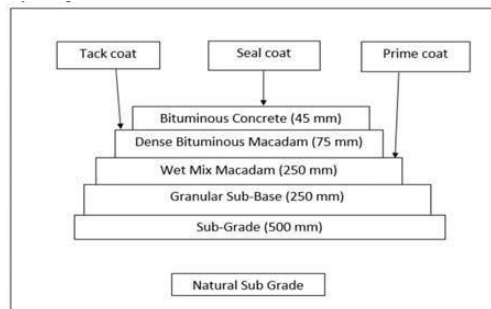
smooth riding surface. It resists the pressure exerted by tires and takes up wear and tear due to traffic. Wearing course act as a water tight layeragainst the surface infiltration.

Fig..2 Lay out of the pavement cross section (Google source)

Road alignment

The position of Centre line of pavement is known asAlignment of the Road. The disadvantages due toimproper alignment are, Maintenance cost of road increased, Vehicle operation cost also increased, Accident cost is increased. The requirements ofAlignment is Safe and Economical. Road alignmentshould be short and easy for convenient moment oftraffic. It should attain a safety to the users and mustbe economical. Alignment should reduce number ofturnings to reduce the road length. Once the road isaligned and constructed, it is not easy to change thealignment due to increase in the cost of structure.Therefore, road must be levelled by conducting roadsurvey. Figure 2 shows the details of pavement crosssection

Table1. Levels of the road with chainage distance.

Chainage	B.S	Left	Cen	Right	F.S	R.L	Rem
0	0.92	1.700	1.701	1.716		99.21	100.9
10		1.710	1.722	1.720		99.19	
20		1.725	1.740	1.775		99.18	
30		1.825	1.857	1.895		99.06	
40		2.050	2.060	2.090		98.86	
50		2.190	2.180	2.200		98.74	
60		2.410	2.345	2.355		98.58	
70		2.490	2.480	2.465		98.44	
90		2.850	2.730	2.700		98.19	
100		8.015	3.000	3.050		97.92	
110		3.250	3.235	3.000	3.215	97.69	97.7
120		1.640	1.630	1.630		97.53	99.1
130		1.950	1.865	1.895		97.30	
140		2.150	2.050	2.020		97.11	
150		2.505	2.300	2.270		96.86	
160		2.655	2.570		2.610	96.59	
170		2.940	2.860	2.770		96.30	
180		3.080	3.020	3.035		96.14	
190		3.170	3.155	3.150		96.00	
200		3.410	3.255	3.310		95.90	
210		.390	3.395	3.340		95.76	
220		3.610	3.560	3.600		95.60	
230		3.700	3.650	3.685		95.51	
240		1.450	1.370	1.376		95.57	
250		1.365	1.355	1.365		95.59	
260		1.290	1.325	1.315		95.62	
270		1.365	1.255	1.255		95.69	

280		1.350	1.400	1.275	95.54	
290		1.395	1.440	1.410	95.50	
300		1.350	1.460	1.390	95.48	
310		1.520	1.450	1.365	95.49	

CHECK:

B.S – F.S = Last RL – First RL(0.92 + 1.445) – (3.215 + 2.610)

= 95.43 – 99.21

2.365 – 5.825 = 3.78

3.78 = 3.78

L.HS = R.H.S

The Table 1 shows the road length measurement chainage (length),BS (Back sight),IS(inter mediate sight), FS(fore sight),RL (reduced levels, Cen (center line). HI (Hight of instrument)

Cross sectional elements Road land width

Road land width is also termed as **"RIGHT-OF- WAY".** The width of land acquired for the road purposes is not is known as Right-of-Way. The desirable land width for the Road KKY is given in the following table

Table 2 Road and lane width .

Lane width

As per the standard specifications of IRC, 73-1980, the recommended lane width is 3.5m for single lane and 7m for double lane. California statehighway standards allows for 3.6m wide lanes for single lane and 7.5m wide for double lane. Since the KKY Road is going to be a high speed facility for the free flow of traffic moment, it was felt necessary to provide the lane width according to the standards as follows.

Table 3. Lane width

Lane	Lane width (m)
Left lane	7
Right lane	7

HI (1) = B.M + B.S   = 100+0.92

HI (1) = 100.92 RL = HI – F.S / I.SRL = 100.92-1.701

RL = 99.212   .

Change point   CP   =   H.I   –   F.S= 100.92 – 3.215 = 97.705

HI (2) = C.P + B.S= 97.705 + 1.445

Width of the shoulder

Shoulders are provided on either side of the carriageway and it plays a very important role in the capacity of the carriageway. The shoulders, soprovided not only as emergency lane but also act as parking lanes. Since, the vehicles will be parked on theshoulders, they will not abstract the free more of the traffic on the carriageway. The width of the Road KKY is given in the Table 3 as follows,

When the traffic increases about 2000 vehicles/day, itis   necessary to increase the width of the paved shoulder in excess of 3m. In the present case of KKY road, earthen shoulders of 1.5m are provided, which can be easily modified to paved shoulders whenever required in the future. Table 4 shown in the width .

Camber

The slope provided to the surface of the road which has to be at the transverse direction is said to be camber. The primary function of the camber is to drain out the rainwater from the road surface around the edges. It is also termed as cross slope of the road.The design values of the cross slope are usually basedon the type of pavement and often on the

Table 5 Traffic details

LOCATION	Two Wheel Vehicles	Three Wheel Vehicles	Four Wheel Vehicles	Heavy Loaded Vehicles
NizamsagarRoad	3356	2786	2160	9
LayolaSchool	2948	2377	1901	7
Jeevadhan	3464	2896	1822	7
Kalkinagar	2685	2432	1720	6
Devunpally	1829	2004	296	10
Lingapur	709	1964	222	8

Design period
A 20 years design period (2021-2041) is assumed forthe design on flexible pavement of KKY road.
Required tests
Traffic survey
   An accurate estimate of the traffic is very essential forthe design of a road pavement and for the complete project report on the road. It includes planning, designing, operation and financing. Traffic survey is carried out to assess the present day traffic and its characteristics. Traffic volume is No. of vehicles crossing a section of road in unit times is known as Traffic volume. Unit is Vehicle/hour per lane Or Vehicle/day per lane.
Method of volume counting
- Manual method
- Automatic Record method

Manual method The vehicles crossing over a particular section of the road are to be countedmanually and noted down clearly. A manual calculation is made to count the vehicles whichpasses over, in a particular unit time.

Automatic record method In this method, the no. of vehicles crossing over a section are counted automatically through video graphs. Thesevideo graphs will shoot the vehicles moment and MSROADS is the software used to calculate the traffic flow based on the video graphs taken. The Table 5 shows the traffic details of study area.

We have different types of tests to identify the properties of soil and bitumen in pavement construction. Following are the tests required for soil and bitumen. Sieve Analysis, Bitumen , Extraction test, CBR test, Penetration test. Sieve analysis is doneto find out the distribution of the coarser layers of different size particles. Sieve analysis can be carried out by Take the sample and weight the sample. All sieves must be cleaned.. Sieves are arranged in ascending order. And also pan is placed below sieves

.In top sieve sample is placed and cover it with cap. Place this sieves in sieve shaker and shake it for 10 minutes. Remove the sieves from shaker and note down the each weight of sieve and also weigh sample.Table 5 shows the results of the sieve analysis.

Table 5. Observations and calculations

Sievesize	Weight retained	% Weight retained	Cumulative % weight retained	% fineness
40mm	10kg	10%	10%	90%
20mm	35kg	35%	45%	55%
12mm	25kg	25%	70%	30%
10mm	20kg	20%	90%	10%
4.75mm	10kg	10%	100%	0%
Total	100kg		315%	

Load factor = 1.29
CBR TEST
$1.45Kg/cm^2 = 22*1.29/\pi/4*d^2 = 22*1.29/\pi/4*5^2 =$
To determine the bearing capacity of a soil.

As per IS 2720-part (16) Loading machines cylinder moulds 150mm diameter and 175cm height having a collar of 50cm length and perforated base which is detachable, compaction rammer. IS sieves of20mm, filter paper, balance. .By using 20mm sieve sample is sieved. 5kg of sample is taken. Then add water to the sample upto it reach optimum moisture content After adding the water mix the sample gently at the bottom of the mould spacer disc is placed and over the spacer filter paper is Placed The sample is divided into 5 parts.The mould is cleaned and oil is applied. fill the mould of one fifth with prepared sample of soil. .By giving 56 blows soil is compactedsame process is repeated upto 3 layers collar is attached after 3rd layer. Same process is repeated. A weight of 2.5 kgs is placed on the soil surface top. on testing machine specimen is placed and plunger is brought near to soil sample a load of four kgs is applied. Dial reading is adjusted. penetration power rate 1.2mm per min.. Table 6 showing the observation and calculations CBR test. And Fig 2 shows the graph of the CBR results.

Table 6. Observations and calculations

Penetration	ProvingRing Reading	Load Intensity (Kg/cm^2)	StandardLoad (Kg/cm^2)
0.0	0	0	
0.5	22	1.45	
1.0	38	2.50	
1.5	52	3.42	
2.0	75	4.93	
2.5	93	6.11	70
3.0	110	7.23	
4.0	118	7.76	
5.0	131	8.61	105
7.5	144	9.47	
10.0	160	10.52	
12.5	172	11.31	

Calculations

Load intensity = Proving ring reading*load factor/Area of plunger CBR at 2.5 mm penetration = 6.11/70*100 = 8.72% CBR at 5.0 mm penetration = 8.61/105*100 = 8.2% So Value of CBR = 8.72%
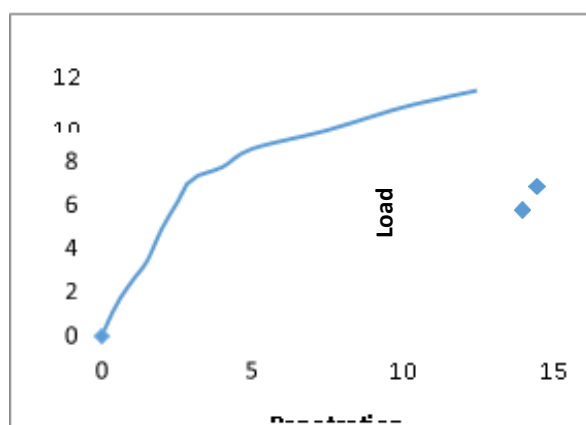
Fig. 2 Result of the CBR value (8.72%).

Penetration test

To find the bituminous material consistency. Take A flat bottomed cylindrical metallic dish of 55 mm in diameter and 35 mm depth. Tray , water bath, needle, thermometer, penetration apparatus and timer. A Sample of bitumen is taken and poured into a container. The depth of bitumen in container should be 15 mm. The container is placed in a water bath at 25^0 C temperatures for one hour. After one hour the sample is taken out from water bath. Then it is placed in penetration apparatus. The needle is brought in contact with the surface of bitumen sample. The dial reading is noted. The needle is released and it is allowed to penetrate for 5 seconds and dial reading is noted. At least 3 penetration readings should be taken on same sample. The mean value of three readings is taken. Table 6 Observation & calculation Penetration Test.

Table 6 Observation & calculation Penetration Test.

Penetration of dial reading	Trial 1	Trial2	Trail3
Initial	200	264	333
Final	264	333	407
Penetration value	64	69	74

Mean Penetration value = (64+69+74)/3 = 69

The penetration value is 69. Based on this value we will find out the grade of bitumen.As per IS Code 73:2006

Table 7 Observation & calculation

BITUMEN GRADE	PENETRATION VALUE
S-35	30 - 40
S-45	40 – 50
S-55	50 – 60
S-65	60 – 70
S-90	80 – 100
S-200	175 – 225

9.2 Embankment Construction

As the penetration value is 69, So the grade of bitumen is S-65. Results of the Penetration value are 69. Grade of Bitumen is S-65.

Bitumen extraction test

To find the amount of bitumen present in bitumen concrete mixture. Bitumen extractor machine, filter paper, benzene petrol/diesel, aggregate-bitumen mixture, centrifuge, balance, beaker foe collecting extracted material. Required. Take some sample of bitumen and weigh the sample as W_1. Then the sampleis placed in the cup of centrifuge. Note down the weight of filter paper as F_1.Add benzene into the cup up to the sample top. The benzene and bitumen will drain out completely from beaker. Now again addmorebenzene and repeat the same process. Run the centrifuge again ang again until total bitumen is extracted. Weigh the extracted material as W_2. Removethe filter paper and dry it in oven at 1050^0 to 1100^0temperature and allow it to cool to the room temperature. Then again weigh the filter paper as F_2.

Calculations

Weight of the sample W_1= 1236 gms. Weight of the filter paper before test F_1 = 2.5Weight of the filter paper after test

F_2 = 3.1 Weight of the aggregate after extraction

$W_2 = 1175$ gms. $W_3 = F_2 – F_1$ $W_3 = 3.1 – 2.5$ $W_3 = 0.6$

.*Bitumen Percentage = $W_1 – (W_2+W_3)/W_1 * 100$*

*=1236 – (1175+0.6)/1236 * 100 = 4.93%*

Results obtained that bitumen content is 4.93%

9 Road construction activities

9.1Earth work excavation

Excavation is necessary to cut down the trench of excessive masses of earth and to prepare a strong basefor the pavement layers. Required excavations will becarried out accordance to the directions laid down as in a manner approved by the engineers. Excavation ofthe site shall mostly be made with the help of the excavators like Ex-200, Ex-100 or other suitable plants which depends upon the stretches and

The materials which are excavated will be dumped in the site at required location. The materials has to be spread in layers of uniform thickness not excluding 200mm compacted thickness over the entire width of the embankment and shall be graded with motor grades to the required camber. Water content of the material must be checked. Then the material has to becompacted with the help of vibratory roller or 8 to 10 ton of static weight. Each layer is compacted thoroughly to the specified specifications until the layers becomes strong enough.

Sub Grade Construction

The material used for the subgrade shall be usually soil, morrow, gravel, a mixture of these or any other approval material. Material using for the subgradeshould have a sufficient quality which in term indicates the property of the material. It should be freeof logs, roots, stumps, rubbish for any ingredients likedeteriorate or affect the stability of the subgrade. The CBR value of this particular soil is mentioned in the technical specifications of the test results. The materialshall be dumped in the site at respective location in particular layers. Loose voids shall be and replaced with the required material. This subgrade layer is filledwith gravel, soil, morrow or a mixture of these or any other approved materials up to a depth of 0.5m from thebottom of the trench.

Granular Sub-Base Course

GSB is a naturally obtained construction material, which is used for the construction of road as a sub- base layer. Granular Sub-Base layer is laid just above the compacted sub-grade layer in the road foundationsconsists of natural sand, crushed gravel, crushed stoneand it acts as a filter media for road or highway. Maximum particle size in GSB is 75mm, 53mm, 26.5mm. The standard grades are referred from table 400-2 specifications. This GSB acts as a sub-base course which provides structural support to the base course and surface course. It mainly prevents and resists the sub grade soil to enter into the above pavement layer. Mostly the size of the aggregates usedin GSB will be 10mm, 8mm, 6mm, and M sand.

Wet mix macadam

Wet mix macadam (WMM) is a layer laid above the GSB. This WMM is a laying method contains ofspreading and compacting of clean, crushed, well graded granular materials on GSB layer. It is a non- bituminous base course which

consists of aggregates as 70% and M sand of 30%. Aggregate sizes used in WMM are 40mm, 20mm, 12mm, 10mm including M sand. The amount of water absorption for aggregates used in WMM should be less than 2% This material in WMM course should be mixed up with water up to a desired water content. Approximately the water content may be 6 percent. This layer act as a binder material. Compaction of the aggregate should be done thoroughly by sprinkling the required amount of water percent. The material shall be uniform and have to be free of pockets of fine material

Application of Prime Coat
Prime coat is an application of a low viscosity bitumen to the granular base from the preparation of initial layer (surface course) of bitumen. The prime coat is sprayed over the wet mixed macadam layer by using sprayer. This coat will bond the loose material particles together and harden the base surface which in terms provide a work platform for the construction equipment. Materials used in prime coat back bitumen or emulsified bitumen (diluted)

Dense Bituminous Macadam Construction
Dense Bituminous Macadam (DBM) is a binder course which helps the road pavement to withstand the maximum load of more number of commercial vehicles. Mix proportion is of DBM mix will consists of coarse aggregate, fine aggregate and filler in required proportions. Proper blending of the aggregations must be made so that final graduation will reach the satisfactory limits.

Coarse aggregate
The DBM mix should contain coarse aggregate material which retains on 2.36mm sieve. It should be preferably hydrophobic and must have low porosity. In some situations where it founds to have more porous aggregates, then it must be provided with extra bitumen for absorption by aggregates, then it must be provided with extra bitumen for absorption by aggregates to satisfy the design criteria.

Fine aggregate
The DBM mix will consists of fine aggregate material which tends to pass through 2.36mm sieve and retained on 75 microns sieve. This material consists of natural sand, crushed screenings or combination of both. It should be clean, durable, hard, dry and free from any organic matter.

Filler
DBM mix also consists of filler material which acts as binders. The material should pass from 75 micron sieve. Generally, filler material includes cement, hydrated lime, stone dust, fly ash or any other non- plastic mineral matter. Usually, requirement of filler is reached out by the material passing through 75 microns sieve in fine aggregate, if FA is not sufficient then extra filler is to be added. Extra filler shown in the table

Table 7 sieve and % of passing

Sieve (microns)	% passing
600	100
150	At least 90
75	>70

Preparation of mix and construction
Preparation of mix according to the specified proportions is carried out in near by hot mix plant of adequate capacity. The mix is them transported by tipper truck to the site and then it is laid by using mechanical power. A layer of 75mm and DBM mix is laid over the road by providing a camber of 5mm on either sides of divides. Then it is compacted to 60mm thickness binder course is uniformly laid.

Application of Tack coat
The layer between dense bituminous concrete (BC) is called Tack coat. The main purpose of the tack coat is to make bond between DBM course and BC course. If tack coat is absent, bituminous concrete will tends to cause slip under the traffic load and failure of pavement will occur due to spalling of bituminous concrete. If BC is directly laid over DBM, the bitumen is BC will not be enough to form a long lasting effective bond between those two layers.

Bituminous concrete (BC) Construction
Bituminous concrete is a construction material which is mainly used for the paving of roads. It is obtained from blending of stones and other forms of aggregate materials mixed together by a binding agent. This binding agent is known as "bitumen" and it is a by- product of refining of petroleum or crude oil. This bitumen is easy to produce, reusable, non-

toxic and it is a strong binder. For required bituminous concrete material, at least one single sample for every 100 tones of the mix is to be needed for testing. Test on bitumen is carried out in hot mix plant. The tested sample is conveyed to the site and laid over the DBM layer. This BC course will be laid with a thickness of 45mm and it reaches to 30mm after compaction. Routine checks on the thickness of BC course should be carried out at site by using gauge. The surface should be then compacted by rollers without any undulations and the surface must be smooth enough for the free moment of traffic.

Application of seal coat

Seal coat is also termed as pavement sealing. It is process of applying a coat to protect bituminous concrete based pavements. It gives protection to the BC course which in terms protects from the elements like water, oils and U V damage. Mixing for seal coatbefore laying should be done thoroughly until the sealer reaches uniform consistency. Seal coat application is also laid by sprayers.

Divider construction

Divider is a concrete structure which acts as median to the carriageway on either sides. Technically divideris termed as "Median". They are mainly meant for thefollowing purposes To avoid the accidents., To installand regulate the traffic signs and traffic signals, To provide lighting systems for the road, In some cases of rural area, vehicles can be park on the median underany emergency, For the project considerations, the design for KKY road has been specified the divider dimension as 1.5m width. Here the divider isconstructed for a height of 1m on the pavement surface. It is designed in such a manner where plantingof trees can be made in between the median.

Shoulder construction

An adequate shoulder is essential part for all the highways. It provides the lateral stability for the pavement and acts as the lane in emergency conditions. It also protects the edges of the road. Theyoften helps in draining out the rainwater flow throughit. Hence, good graded materials are to be used for theshoulder construction.

10   Quality management in construction

Quality management system is a formalized system they are Customer Requirements. Various parameters related to quality are Quality planning, Quality assurance, Quality control, Quality improvement, Customer satisfaction The main principle of quality management is to improvement to work ofcustomer's and focus on leadership. To increasing the productivity rate, etc.. Quality assurance and quality control are two aspects of quality management

Quality Assurance

Quality Assurance is defined as IS0 9000 defines a partof quality management focused on providing confidence that quality requirement will be fulfilled. Quality Assurance is mainly focused on defect prevention. Improving of quality of process and products .The work is done by process oriented.The product development checking by quality assurance. .there shouldn't be any defects Quality assurance is done before the quality control.

The Activities of quality assurance

Planning, Data collection , Quality control , documentation , Evaluation , Reporting Activities.

Quality control

Quality control defines as quality standards and the quality control testing requirements. The Approval of the work done before the starting of the particular works. It generally focused on the identification of works. Quality control is mainly to correcting thedefects .Improving the developments of product. Zerodefects After completion of project there shouldn't be any defects.

11   Equipment's used in the constructionExcavators

Excavators are heavy equipment consisting of boom, stick, bucket and cab on a rotating platform house. Three types of excavators are used. Excavator100. Excavator 200, Excavator 300, 100,
200, 300 represent size of bucket.

Dumpers

Dumpers are used for transportation of bulk materials such as sand, gravel and dirt. A dump truck consists of hydraulically operated open-box bed hinged at the rear, the front of which can be lifted to allow the contents to be deposited on the ground behind the truckat the site of delivery.

Road Roller

Road Roller is used for compaction of soil, gravel, concrete in the construction of roads. The rollers are used to thoroughly compact the materials and they do not come too loose. Rollers have diesel engine, and a canop y to protect the driver, and a drum, the drum may be vibratory smooth or static smooth drum, to measure the level of compaction and water a compaction meter is provided.

12.3. Mechanical Paver

Mechanical paver is used to laying the bitumen on theroads. The bitumen mix is loaded into the mechanicalpaver through tipper Then it spreads on other side andlays The bitumen. This machine also helps in fixing the gradient of road on either side. Laying of bitumenthrough paver should ensure that no small lumps of aggregate or stone to be left over the surface. The standard width of paving is 8-12 ft (2.4-3.7). Mechanical paver also helps in partial compaction of bitumen on the surface of road.

12.4 Sprayer
Sprayer is usually known as bitumen distributor. A bitumen sprayer works as a controlling agent of the flow of bitumen and to spray the bitumen evenly on the road surface. This is mainly used for laying of prime coat, tack coat and seal coat. Spraying is generally made before the laying of hot mix bitumen on the road surface. The most basic quality of this sprayer is to store the bitumen in a tank, heat when requires and spray on the road easily.

CONCLUSIONS

Construction of flexible pavement for **KKY** road is followed the specified design data.CBR value for soil sub grade used for the road construction is underallowable limit i.e., 7.32%.Tests required for the materials used in the construction are tested in treatment plant and adequate results have been obtained. Traffic survey for KKY road is made through manual counting and allotted a design period of 20 years for the pavement. According to design of pavement, the each layers has: following thickens are SUB GRADE , GSB , WMM , DBM, BC 500mm,250mm, 250mm, : 75mm, 45mm. For the above design, the meterial and aggregate tests conducted according to IS code and they are within design limits.Finally, a complete general report for FlexiblePavement Design of KKY road with a reach of **97/4 to99/4 [2 km]** is written considering all the steps involved in construction. Acknowledgement :Thank tothe contractors who is executed the work and supported .

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