

Construction of Village Roads under Zilla Parishad

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Abstract- As per 2011 census, 70% of the India's population belongs to rural areas. Therefore rural connectivity becomes a pivotal component within the socio-economic development of rural people by providing access to facilities like education, health, marketing, etc. Rural development has become a matter of growing urgency for considerations of social justice, national integration and economic upliftment and inclusive growth. Just in case of rural development, to enable the rural people to own access to varsities, health centre, markets etc. the availability of rural road network may be a key component. Village roads functions as an entry point for poverty alleviation. Village roads acts a facilitator to market and sustain agricultural growth, improve basic health, provide access to colleges and economic opportunities and thus hold the key to accelerate poverty reduction, achievement of Millennium Development Goals (MDG) socio-economic transformation, national integration and breaking the isolation of village communities and holistic and inclusive rural development. Within the fourth Road Development Plan (2001-2021), target of constructing the village roads is accomplished to an excellent level but yet it's not achieved cent per cent due to various issues.

Key Words: Village Roads, Zilla Parishad, WBM, PMP, OGC Carpet, Seal Coat, Etc.

Introduction

Zilla Parishads are the part of Panchayati Raj Institution within the state. Works Department in the Zilla Parishad deals with construction of mainly Village Roads and Other District Roads within the district. For these construction practices and maintenance funds are allocated by the State Governments under various developments schemes like State Road Funds. Construction of village roads can be carried out by two methods based on CBR

1) Flexible Pavement Construction

2) Rigid Pavement Construction.

Generally village roads are of flexible pavement type roads. The objective of this paper is to review the flexible type pavement construction under the Works Department of Zilla Parishad Osmanabd (Maharashtra). Flexible type of pavement construction is employed in this district because the soil in the area is robust enough to sustain the load and it does not settle more. CBR of soil in this region is in the range is 7 to9 which is considered as good for constructing flexible type pavement.

Methodology:

Generally village road consists of embankment also called as subgrade, constructed using local soils, sub-base or a blanket layer of moorum, gravel followed by base course and sealing with thin bituminous surface course.

Construction Techniques: Traditional construction methods are typically labour based and most of the development operations are meted out manually. Just in case of mechanised method of construction, most of the operations are finished the assistance of machines. Undoubtedly, a contemporary mechanised method will cause efficient output and can also help in maintaining the higher quality of construction. However, considering the magnitude and scattered nature of those works, modern mechanised methods are not cost effective so use of traditional and mechanised method is preferred.

Embankment and Subgrade: Construction of embankment and preparation of subgrade are a part of earthwork. The most activities related with this construction are, soil survey and construction of embankment and subgrade.

Embankment with conventional earth: The peak of road embankment depends on the Highest flood level (HFL) and is kept generally 0.6 to 1.0 m height above HFL. The embankment is built by rolling thin layers. Each layer is compacted by roller to a desired density before the subsequent layer is placed. Compaction is carried out at optimum moisture content so as to get the benefit of maximum dry density. The thickness of each compacted layer is kept in between 150 to 300 mm. Compacted thickness isn't allowed to exceed 150 mm using ordinary 8-10 tone roller. For earthwork construction, the loose thickness of the soil layer is kept normally 200 mm when ordinary 8-10 Tone rollers are used.

Subgrade with natural earth: The preparation of subgrade includes site clearance, grading and compaction to desired density at optimum moisture content. The subgrade is situated on embankment or excavation or at the existing ground surface betting on site conditions. The top soil consisting of grass, roots, rubbish and other organic matter is made clear. Then grading operation is started so as to bring the vertical profile of the subgrade to designed grade and camber. The compaction process begins at the edges and progress towards the centre except at super-elevated portions where it is commenced from lower edge and progress towards higher edge. The subgrade is finished to the desired profiles; a camber board is employed to test the cross slope. When the soil does not fulfill the necessities of normal subgrade, a stabilization technique is used to modify and improve the identical. Generally it is stabilised with gravel/moorum. It is ensured that the gravel/moorum used must contain a good proportion of all the particle sizes along with sufficient fines to provide proper cohesion. The maximum aggregate size is generally not allowed to exceed one-third the thickness of compacted stabilised layer. The layer is thoroughly compacted and laid to proper profiles.

Surface drains: The fast disposal of runoff on the paved surface is achieved by surface drainage.

Surface drains are excavated to the desired lines, grades, levels and dimensions. The excavated material is off from the area adjoining the drains and if found suitable, is utilised in embankments or subgrade construction. All unsuitable materials are disposed off. If required, the drains shall be lined with suitable material.

Water bound macadam (WBM): WBM is also used as sub-base as well as base course and also surface course for rural roads. In both the cases, it is constructed in conformity with line, grades and cross-section as shown on the drawings. The prevailing surface which receives WBM course is prepared to the desired grade and camber and cleaned of all dust. The amount of binding materials is relied on the type of screenings. Generally, the quantity required for 75 mm compacted thickness of water bound macadam is about 0.06-0.09 cum/10 sqm. There is construction of side shoulders in advance to a thickness akin to the compacted layer of the WBM course.

Quantities Required for 75 mm and 100 mm Compacted WBM Course

Size Range of Coarse Aggregate (mm)	Compacted Thickness (mm)	Loose Qty Of Coarse Aggregate in Cum	Stone Screening		Crushable Type Such as Moorum, Gravel in Cum
			Size(mm)	Qty Cum	
53 to 22.4	75	0.91 to 1.07	Type B 11.2	0.18 to 0.21	0.22 to 0.24

The coarse aggregate is spread uniformly and evenly upon the prepared base. These are not allowed to dump in heaps directly. The aggregate is spread to proper profile by using templates which are placed across the road 6m apart. Immediately after the spreading of coarse aggregate rolling is started. Rolling begins from the edges gradually progressing towards the centre. Rolling is discontinued when aggregates are partially compacted with sufficient void space in them to permit application of screenings. During rolling slight sprinkling of water may be done, if necessary. After coarse aggregate are rolled, screening is applied gradually over the surface to fill the interstices. Dry rolling is done when the screening are being spread. After the application of screenings, the surface may be copiously sprinkled with water, swept and rolled.

Shoulder: Shoulder gives adequate side support to pavement and also drains off surface water from the carriageway to the road side drain.

Modified penetration macadam (MPM): A thin premix carpet (20-25 mm) laid directly on granular surface gets deteriorated fast if the traffic in all fairness is high. Therefore, it is essential to have transition/intermediate layer. Therefore, we consider

the use of penetration macadam, modified penetration macadam, built-up spray grout etc. Built-up spray grout involves use of mechanically crushed metal. However, the requirement of crushed metal is reduced in the case of penetration macadam and modified penetration macadam, as hand broken metal by local unskilled rural labour can be used and is also cost effective. The work consists of supply of materials and labour required for providing and laying MPM surface for compacted thickness of 50 or 75 mm. This item includes preparing the existing road surface to receive the MPM course, i.e., cleaning of the existing WBM surface spreading of 40 mm size metal layer in required thickness, with compaction with power roller, heating and spraying bitumen with sprayer, spreading key aggregates and final compaction with power roller, etc.

Material Specification:

Aggregates: The aggregate for providing MPM surface is comply with MoRT&H Specifications and is normally comply with the following regarding size and quantity of aggregates

Description	Rate of Application per 10 Sqm area			
	75mm		50mm	
	On Asphalt Surface, Cum	On WBM Surface, Cum	On Asphalt Surface, Cum	On WBM Surface, Cum
40mm size hand broken metal	0.9	0.9	0.6	0.6
12mm size chips	0.18	0.18	0.18	0.18

Bitumen : The bitumen is of paving grade of S-35 to S-65 (30/40 to 60/70) as per IS:73-1992 specifications. The rate of application 75 mm and 50 mm MPM to be constructed over existing bituminous or WBM surface is

Description	Rate of Application for 10 Sqm area in kg			
	75mm		50mm	
	Bituminous Surface	WBM Surface	Bituminous Surface	WBM Surface
Bitumen for Grouting	20	20	17.5	17.5
Tack Coat for Existing Bituminous Surface	5		5	

Preparing the Base: Any pothole in the existing bituminous road surface and broken edges are repaired in advance and the surface is brought to correct level and camber with additional metal and bitumen as required. Before starting the work, the surface is swept clean of the entire dirt, mud cakes, animal droppings and other loose foreign material.

Tack coat on Bitumen Surface

Application of tack coat for existing bituminous surface is only at the rate of 50 kg/100 sqm

Spreading and Compaction

40 mm size metal is spread evenly at the specified rate of 9 cum or 6 cum per 100 sqm of area so as to form a layer (for 75 mm and 50 mm MPM respectively) over the width of road with correct camber/super elevation as required. Any foreign matter, organic matter, dust, grass etc. is removed immediately. The sections are checked with camber board and straight edge batten etc. Any irregularities made good by adding or removing aggregates. Then rolling with 8 to 10 ton power roller is started. Rolling is commenced from the edges and progresses towards centre.

Rolling is continued till the entire surface is rolled to desired compaction such that there is no crushing of aggregates and all roller marks are eliminated. Each pass of roller is uniformly overlapped not less than one third of the track made in the preceding pass.

Application of Bitumen

Bitumen of paving grade VG30/40 or VG60/70 is supplied for the work and is heated to temperature of 175°C to 190°C in a traditional furnace and the same temperature is maintained at the time of actual application. The hot bitumen is applied through a hand sprayer on road surface uniformly at the rate of 20 kg/ 10 sqm or 17.5 kg/ 10 sqm as the case may be. The road surface is divided into suitable rectangles marked by chalk so as to ensure correct rate of application of the bitumen.

Key Aggregates:

On completion of bitumen application, 12 mm size key aggregate is spread immediately at a uniform rate of 1.8 cum or 1.2 cum per 100 sqm. Brooms are used to ensure even distribution of key aggregate.

Final Compaction

Immediately after spraying of bitumen and spreading of key aggregates, the surface is rolled with a power roller to obtain full compaction. The rolling is continued till the asphalt surface hardens and key aggregates stop moving under power roller.

Open graded premix carpet with seal coat:

The open graded premix carpet construction is of mixed bituminous material which is laid in compacted thickness of 20 mm followed by a seal coat. The aggregate quality for premix carpet is conformed to requirements. The binder used is paving bitumen conforming to IS:73- 1992 or emulsion conforming to IS: 8887- 1995 specifications or modified bitumen conforming to IRC:SP:53. Generally only bitumen is used as binder. The quantity of materials required for 10 sqm road surfaces for 20 mm compacted thickness of open graded premix carpet are

Aggregate		Bitumen kg per 10 sqm
Size, mm	Quantity, cum per 10sqm	
22.4-11.2	0.18	14.6
13.2-5.6	0.09	

Temperature of ingredients and mix

Grade of Bitumen	Temperature C			
	Bitumen at Mixing	Aggregate at Mixing	Mix Delivered at Site	Mix at the Time of Rolling
VG 30/40	165-170	170-175	135-155	>100
VG 60/70	155-165	160-170	130-150	>95

Seal Coat: These types of construction are employed for sealing open graded premix carpet. The binder used is bitumen of VG30/40 grade. The grading and quantities of binder are

Type	Aggregate		Bitumen	
	Specification Size, mm	Quantity, cum	Specification	Quantity, per 10sqm
A	11.2-2.36	0.09	S-65	9.8
B	2.36-0.18	0.06	S-90	6.8

References: 1) Indian Road congress Special Publication 20 Rural Road Manual New Delhi 2002

2) Working Group on Rural Roads In the 12th FIVE YEAR (Govt. of India, Planning

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3) IRC :37-2001 Guidelines for the Design of Flexible Pavements (Second Revision)