

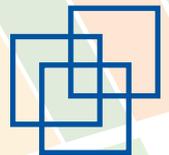


सत्यमेव जयते

MINISTRY OF RURAL DEVELOPMENT

RURAL ROAD MAINTENANCE TRAINING MODULES FOR FIELD ENGINEERS

Module-4 PLANNING, INSPECTION, REPORTING AND MONITORING





Ministry of Rural Development

RURAL ROAD MAINTENANCE TRAINING MODULES FOR FIELD ENGINEERS

Module-4

Planning, Inspection,
Reporting and Monitoring



This training module is produced through a collaborative effort between the International Labour Organization and the National Rural Road Development Agency under the technical assistance component of the World Bank supported Rural Roads Project-II of Pradhan Mantri Gram Sadak Yojana Project (PMGSY).

Contents:

- Maintenance Management Cycle
- Road Inventory
- Road Condition Survey
- Road Priority Index
- Prioritization for Annual Maintenance Plan
- Scheduling of Planning Activities
- Reporting and Monitoring

Learning Objective:

At the end of this Module you are expected:

- To understand maintenance management cycle
- To be able to conduct road inventory and condition survey
- To know the road priority index
- To be able to plan and organize their maintenance works in a systematic and efficient manner
- To be able to monitor maintenance works

Acknowledgement

The following publications were also used as reference materials:

- Managing Maintenance of Rural Roads in India, ILO/NRRDA, January 2015

Foreword

Pradhan Mantri Gram Sadak Yojana (PMGSY), was launched in December, 2000 as a special intervention of the Government of India with the broad objective of ensuring sustainable poverty reduction. The scheme aims to provide good quality all-weather single connectivity to every eligible habitation. Rural roads are a state subject under the Constitution and as such are the basic responsibility of the states. However under the PMGSY, the construction of good quality and well-engineered roads are fully funded by the central government. Maintenance of these roads is the responsibility of the states. The year 2013 saw the launch of PMGSY-II with the objectives of consolidating the existing rural road network and upgrading existing rural roads that provide connectivity to rural growth centres. PMGSY-II envisages sharing of construction costs between the Centre and the states with maintenance costs continuing to be funded fully by the states.

Over the last 14 years, the PMGSY has carved out a place for itself as a programme characterised by creation of good quality assets, effective management and technical proficiency by the National Rural Road Development Agency (NRRDA), along with capable state road agencies. For implementation and operations, the involved agencies have been supported with detailed documentation in the form of programme guidelines, an operations manual, standard bidding documents, specifications, a standard data book, a procurement and contracts management manual and the Quality Assurance Hand Book with support from the Indian Roads Congress. These documents have also contributed significantly towards effective implementation of PMGSY and even for mainstreaming good practices in other rural roads programmes being executed by the states from their own resources.

An area of concern has been lack of regular maintenance as per the “Programme Guidelines”. However, in recent years, there has been increased awareness and commitment to maintenance by the states. The tempo needs to be sustained and further accelerated.

Under the technical assistance component of the World Bank supported Rural Roads Project-II, the International Labour Organization (ILO), in collaboration with NRRDA has prepared a manual “Managing Maintenance of Rural Roads in India”. This initiated the execution of maintenance works and the development of these training modules for engineers and contractors associated with rural road maintenance works. To strengthen such activities in the participating states of RRP-II, a series of training of trainers workshops were arranged at national and state level based on the course material developed.

The training modules broadly cover the principles for maintenance management of rural roads, planning and execution of common maintenance interventions to ensure reliable transport services and safety to users and the local communities served by the rural roads, and arrangements for monitoring the performance of contractors engaged for the task.

I would like to acknowledge the support of all those associated with the development of these training modules, especially the ILO and its technical assistance team, Mr. Htun Hlaing, Mr. Bjorn Johannessen and the project's Rural Roads Maintenance Engineers. I would also place on record the valuable suggestions of my colleagues Ms. Manju Rajpal, IAS, (ex Director – RC), Mr. R. Basavaraja, Director NRRDA, Mr. S. S. Bhatia, Deputy Director, NRRDA, Mr. A. K. Sharma, Consultant World Bank and senior engineers as well as secretaries from State Governments in bringing the document to its present shape.

I sincerely believe, the training modules would be found useful for the states in their efforts to secure adequate maintenance of all rural roads, not merely the PMGSY roads and improve maintenance practices so that benefits of access continue to remain available for our rural people on a sustainable basis.

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Introduction to Training Modules

The purpose of this training manual is to provide technical management staff and contractors with appropriate guidelines for the effective management of road maintenance works. The training modules are based on the manual “Managing Maintenance of Rural Roads in India”. These modules broadly cover the principles for maintenance management of rural roads, planning and execution of common maintenance interventions to ensure reliable transport services and safety to users and the local communities served by the rural roads. The arrangements for monitoring the performance of contractors engaged for the task are also covered in these modules.

This manual is broken down into the following categories composed of different modules:

Module 1: INTRODUCTION

Module 2: TECHNICAL CONSIDERATIONS AND IMPLEMENTATION ARRANGEMENTS

Module 3: FINANCING RURAL ROAD MAINTENANCE

Module 4: PLANNING, INSPECTION, REPORTING AND MONITORING

Module 5: APPROPRIATE SETTING OUT TECHNIQUES

Module 6: HAND TOOLS, EQUIPMENT & CONSTRUCTION MATERIALS

Module 7: ROUTINE MAINTENANCE WORK METHODS

Module 8: OCCUPATIONAL HEALTH & SAFETY, ENVIRONMENTAL ISSUES AND DECENT WORK

Module 9: CONTRACT MANAGEMENT

The trainer may decide to conduct a full course consisting of all the nine modules or may selectively conduct specific modules depending on the needs of the target group.

As a general advice the trainer should:

- **Encourage active participation**

There is sometimes a tendency of the trainer to act like a teacher in school and to read or lecture directly from the course material. This behaviour should be avoided. Trainees remember information better if they participate actively in discussions and if there is a free exchange of views and of questions between everyone participating in the course.

- **Guiding the discussion**

There are times during a discussion when everyone wants to speak at the same time. When such situations arise, the trainer should insist that the group listen to one person at the time. If one speaker hijacks the floor too long, the trainer needs to interrupt, pointing out that other participants may also want to speak.

- **Listen attentively**

Equal attention should be paid to each speaker. Listen attentively and let the speaker understand that ideas and opinions expressed are both interesting and relevant. It is sometimes useful to take a brief note of participants' suggestions while they are speaking, noting them down on a flipchart or blackboard. A summary of these notes may prove useful for later discussions.

- **Emphasise important points**

Each time the participants make an important point or expresses an interesting opinion, the trainer should draw the group's attention to it by repeating the idea in simple terms which are understood by the majority of the trainees.

- **Preparing the sessions**

When trainees only listen to a description of how a particular job should be done, they are likely to forget what they heard. If however, they actually carry out the task concerned, they will remember how to do it. For this reason, every effort should be made to include as many practical exercises and demonstrations as possible, be they carried out on the worksite or in the training room. Practical sessions should always be carefully planned in advance.

- **Recapping**

A discussion is more than just a conversation. A subject is discussed with an aim in mind. It may occasionally be worthwhile recapping the topic considered and recalling the aim of the discussion by intervening from time to time to give a brief summary of the main points dealt with so far.

- **Questioning**

An important role of the trainer is to ensure that the atmosphere during training is sufficiently relaxed to allow participants to feel at ease to speak freely. Questions set by the trainer should not be regarded by the trainees as tests. Often there is no strict "right or wrong" answer to a question, except for mathematics. Questions should simply give your trainees the opportunity to put forward their individual points of view.

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Planning, Inspection, Reporting and Monitoring

4.1 INTRODUCTION

In order to have a good road network prescribing to the desired level of service, it is imperative to have a well-planned, consistent, transparent and visible preventive maintenance system in place. The system should be such that it assesses the actual condition of both the carriageway and off-carriageway. It is also necessary to know the traffic plying as well as the importance of the road. These assessments shall provide a holistic view of the maintenance status of each road and help in prioritization of the maintenance of the road network based upon the available budget each year. In other words, what is required is a robust Road Maintenance Management System (RMMS) which would help in evolving a prioritized Annual Maintenance Plan (AMP) for the entire road network each year based upon sound, measurable parameters so as to have a defined level of service throughout the year.

4.2 MAINTENANCE MANAGEMENT

Like any civil works, road maintenance require careful planning, supervision and control.

It may be divided in two parts such as:

- I. Preparation of annual maintenance plan.
- II. Scheduling and annual maintenance calendar.

Before these planning and implementation activities commence, there is a need for a detailed survey of the road condition during which all defects and damages to the road are carefully assessed. This survey provides the basis for the planning of the consecutive maintenance works.

Proper monitoring of outputs and the resources required to achieve these outputs provide the basic information needed for planning and estimating of future maintenance works.

Figure 1: *Maintenance management cycle*



Figure 1 shows the maintenance management cycle with the various steps and their logical sequence necessary for achieving an effective maintenance management system.

4.3 ANNUAL MAINTENANCE PLAN

An Annual Maintenance Plan for any road network shall comprise primarily of the following components:

- Road Inventory Survey
- Road Condition Survey- Road Condition Index (RCI)
- Road Priority Index (RPI)
- Up dated Schedule of Rates
- Cost Estimate
- Prioritization of maintenance activities based upon the available budget
- Scheduling of activities for management, procurement and execution

4.3.1 Road Inventory Survey

This is the first step towards planning of maintenance operations of any road network. In order to make rational decisions on how a road network can be maintained and improved, it is important to assemble adequate information about its current extent and condition and how it serves the transport needs in the area in which it is located. This would include details of road length, carriageway and formation widths, location and type of culverts/bridges, road side drains, details of other road furniture, pavement configuration, public utilities, buildings and other structures along the road. It may also contain information pertaining to the function and importance of the road, such as traffic volume and history, the villages

Table 1: Information collected during road inventory

Road Inventory Information	
Geometry	<ul style="list-style-type: none"> • alignment • profile • cross-section
Pavement	<ul style="list-style-type: none"> • soil conditions • type of pavement
Drainage	<ul style="list-style-type: none"> • culverts and causeway • mitre drains • catch water and cut-off drains
Structures	<ul style="list-style-type: none"> • type and size • location
Condition	<ul style="list-style-type: none"> • Overall condition of the road and its main structures
Junctions	<ul style="list-style-type: none"> • location • type of connected road
Climate	<ul style="list-style-type: none"> • rainfall • flood patterns • adjacent water management
Traffic	<ul style="list-style-type: none"> • annual average daily traffic
Maintenance	<ul style="list-style-type: none"> • details of routine maintenance i.e. names of petty contractors • details on rehabilitation and urgent maintenance works, e.g. date, location

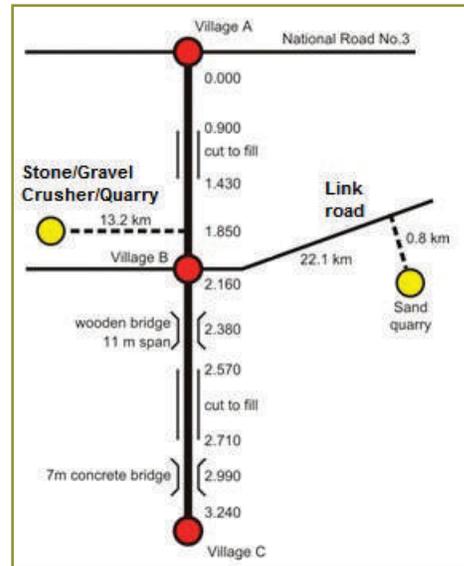
served, population numbers and other important infrastructure in the vicinity of the road, such as clinics, schools, irrigation systems, agricultural service centres, government offices, markets, etc. In general, road inventory data may comprise of information pertaining to items as outlined in Table 1. Like any other assets owned by the government, it is important to keep records of its components to ensure that they are adequately protected and maintained.

A format of the road inventory data collection is set out in Annex 1. As designed and recommended in the Operations Manual for the PMGSY the Inventories of each rural road in Division/District may be prepared once in Format - A and updating of inventories shall be done every year, depending on local conditions, in Format - B at Sr. No. 12 onwards as the information to be compiled at Sr. No. 1 to 11 are the Base Line data.

In addition, the location of the road assets are identified with the use of maps describing each individual road as well as the network as a whole. The maps range from simple hand drawn strip maps (Figure 2) to advanced computerised Graphical Information Systems (GIS) in which all the data is linked to a digital map.

Maps form an important basis for the planning of any type of infrastructure. They provide a good graphical presentation of the transport needs and patterns in a given area, and together with data relating to the location of villages, economic activities and social services, it is possible to establish a good overview of the transport situation.

Figure 2: Strip map



The use of maps for infrastructure planning is carried out at two levels, (i) for the overall planning of development works in a given area, and (ii) for planning specific road maintenance and improvements works.

For technical staff in charge of the management of a road network, the use of maps is more specifically related to locating where works are required in order to maintain and improve the condition of the road network. Maps are therefore used for specifying works in detail and are often included as part of project designs and contract documents. Together with information on the condition of the network, they provide a good overview of the network as a whole.

An inventory forms the basis for any asset management of the road network. Combining this inventory with a regular assessment of its condition provides

the basic justification for any road improvement and maintenance programme. Through a road condition inventory, it is possible to monitor the wear and tear of roads and bridges and on this basis plan and implement timely works inputs to protect and improve the infrastructure.

4.3.2 Road Condition Survey

In order to assess the needs for and to plan future improvement and maintenance works, it is necessary to maintain an intimate and up-to-date knowledge of the condition of the road network and for this reason it is good practice to carry out regular road condition surveys. Such surveys form a solid basis for future work programming and budgeting. Road condition surveys allow the road authority to:

- become thoroughly familiar with the road network and its maintenance challenges and on this basis make objective and quantified assessments of the condition of each road,
- make objective prioritisations of maintenance and improvement works in line with sound asset management principles,
- review the effectiveness of maintenance activities carried out since the previous surveys, and
- programme in detail the improvement and maintenance works to be carried out during the next construction season.

The Road Condition Survey is required to be carried out at every 100 metre interval for every 1km of the road length by the Junior Engineer in charge of the section and assisted by his Work Inspector/ Mate. The attributes for road condition survey data should comprise details of potholes, broken edges, ruts, depressions, pavement failure, cracks and shoulder condition. These details can be collected through visual inspection and/or with horizontal straight edge and ruler. The data needs to be classified under various headings namely, GOOD, FAIR and POOR with rating assigned to each classification.

Figure 3: *Carrying out road condition survey*



The time it takes to carry out the surveys very much depends on the condition of the road. Obviously, it is easier and quicker to survey roads in good condition where there is a limited amount of defects. Roads in a fair condition have more defects and require more time to survey. Equally, when there is a backlog of maintenance works, the survey works will be more time consuming.

The main purpose of the condition surveys is to establish a sound basis for planning of maintenance works. Maintenance is carried out at different times of the year, i.e. before, during and after the seasonal rains. Road condition surveys need to be organised in advance, thereby allowing for the actual works to take place at the right time. Once a practice of regular surveys and maintenance works has been established, the surveys become less time-consuming as there are fewer defects to record.

A format of the data collection of the above attributes at every 100 metre intervals for every 1km of the road length is set out in Format B under Annex 1. This road history is to be updated yearly.

Based on the road condition data, collected as per above format, the condition of the road varying from Good to Poor can be classified by providing weightages as given in Table 3. With the help of this table, the Road Condition Index can be worked out.

Table 2: Road condition inventory form

Road Condition Inventory and Maintenance Planning				Road: Village A to Village B										
				Div: _____		Page: _____ of _____								
				Last major intervention: month/year _____										
				Chainage										
				0+000	2	3	4	5	6	7	8	9	1+000	
Road inventory data and condition assessment	Cross section type													
	Carriageway width	m												
	Embankment height	m												
		Type	Cond.	Description										
	Subgrade		G/F/P											
	Subbase													
	Base course	WBM	G											
	Surfacing	PC	G											
Side drain Left (depth)	m	0.3	←-----→											
Side drain Right (depth)	m	0.3	←-----→											
Proposed maintenance interventions				Unit	Qty									
Left side	Bush clearing (width)	m	700	←-----→										
	Clear side drains (depth)	m	500	←-----→										
	Clear mitre drains (depth)	m	150	←-----→										
	Shoulder repair	m	600	←-----→										
	Side slope repair	m												
	Carriageway	Debris removal			←-----→									
Pothole patching		m2	9	←-----→										
Base course repair		m2												
Crack sealing		m	400	←-----→										
Resealing		m2	16	←-----→										
Thin asphalt overlay		m2												
Rejuvenation / fog spray		m2												
Light grading		m2												
Camber reshaping	m2													
Right side	Bush clearing	m	500	←-----→										
	Clear side drains (depth)	m												
	Clear mitre drains (depth)	m												
	Shoulder repair	m	600	←-----→										
	Side slope repair	m												
Structures, road furniture, other	Culvert/headwall repair	m												
	Repair retaining wall													
	Minor bridge repair													
	Repair of road signs	no												
	Replacement of road signs	no												
	Road marking repair	m												
Road marking renewal	m													
Surveyed by: _____		Date: _____		Checked by: _____		Date: _____								



Table 3: Road condition rating chart (being used in HP)

Road Condition Rating Calculation Chart for Rural Roads						
Defect Type		Percentage of Damage				
Name	Criteria					
PAVED ROADS						
Roughness ***	IRI (No)	< 6	6 ~ <10	10 ~ <13	13 ~ <15	≥15
Potholes	all	< 1	0 ~ 5	5 ~ 10	10 ~ 20	≥20
Edge breaks	all	< 1	1 ~ 15	15 ~ 30	≥30	
Ruts and Depressions	all	< 1	1 ~ <5	5 ~ <15	15 ~ <30	≥30
Surface cracks	all	< 1	1 ~ 5	5 ~ <15	>15	
	>5 mm	< 1	1 ~ 5	5 ~ <15	>15	
Pavement failures	all	< 1	1 ~ 5	5 ~ 10	10 ~ 20	≥20
Surface texture	<2 m ²	< 1	1 ~ 5	5 ~ 10	10 ~ 20	≥20%
Shoulder deformation edge drop/	>50 mm	< 1	1 ~ 5	5 ~ 10	10 ~ 30	≥30
Shoulder drainage	High/Flat	< 1	1 ~ 10	10 ~ 30	30 ~ 50	≥50
Joint sealant	all	< 1	1 ~ 10	10 ~ 25	25 ~ 50	≥50
Broken/Cracked Concrete	>100 mm	<10	10 ~ 20	20 ~ 30	≥30	
Remaining Life***	% of design	>80	<80 ~ 60	<60 ~ 40	<40 ~ 20	≤20%
Rating		0	1	2	3	4
Rating Score		≤ 8	>8 ~ 19	>19 ~ 27	>27 ~ 34	> 34
UNPAVED ROADS						
Roughness***Km/hr	all	40 ~ 50	30 ~ 40	30 ~ 20	20 ~ 15	<15
Potholes /Edge breaks	all	< 1%	1 ~ 10 %	10 ~ 20 %	20%~>30%	>30%
Surface failures	all	< 1%	1 ~ 5 %	5 ~ 10 %	10 ~ 20 %	>20%
Edge drop (WBM)	>50 mm	< 1%	1 ~ 5 %	5 ~ 10 %	10 ~ 30 %	>30
Camber	Low/Flat	< 5%	5 ~ 10 %	10 ~ 20 %	20 ~ 50 %	>50%
Thickness for gravel	all	>100	>75	>50	<50	
Remaining Life***	% of design	>80	<80 ~ 60	<60 ~ 40	<40 ~ 20	<20%
Rating		0	1	2	3	4
Rating score		<6	>6 ~ 9	>9 ~ 13	>13 ~ 19	>19
Road Condition		Very Good	Good	Fair	Poor	Very Poor
Maintenance Required		Minor Maintenance	Routine Maintenance	Periodic Maintenance	Holding/ Rehabilitation	Upgradation / Strengthening

*** **Note:** Roughness and remaining life have been given the higher priority. Therefore to arrive at the above rating, points for roughness are to be doubled and remaining life to have a maximum of 10. This has been allowed for in the computerized calculation.

4.3.3 Traffic Survey

In several cases the rural roads provide alternative and shorter route to other destination also, mainly in mines areas. Such transfer of additional traffic is not anticipated in design data of rural roads, therefore these roads need additional attention for maintenance. Apart from this situation, there is variation in socio-economic growth among various areas/region – which is indirectly related with variation in traffic intensity growth. Therefore to have the field data about current traffic and its rate of growth are very useful in planning of rural roads maintenance, as such traffic survey on rural roads, specifically on through routes may be conducted once in two years in Format E and Format F, placed in Annex 1.

4.3.4 Road Priority Index (RPI)

It is required in case of constrained budget as is the case in all the States. It should have following parameters:

- Traffic Count – the higher the traffic the higher the priority. The format for conducting traffic count is depicted in Formats E and F referred to in Annex 1,
- Importance of the Road – whether it connects to education/health centre, places of tourist/religious importance,
- Classification of the Road-that is, whether it is a link road or major rural link.

A higher weight-age should be given to the traffic volume on any road.

A format of the attributes stated above and their permissible ranges under the above classifications is set out in Table 4.

Table 4: Road priority index for VR (being used in HP)

Road Priority Index for VR						
Indicator	Rating					
	0	1	2	3	4	Max
A Traffic	Below 50	50 – 200	200 – 500	Above 500		6
B population serviced	Below 50	500 - 2000	2000 - 5000	5001 and above		6
C Terrain	Plain	Rolling	Hilly	Mountainous		3
D Rainfall	Light < 700mm	Medium 701 - 1500	Heavy 1501 and above			2
E Education facilities	No	Elementary	Sec and Higher			2
F Tourist / Religious	No		Yes			2
G Health facilities	None	Sub centre	PSE/CSE and above			2
H Market & Industry	No	Health Centre	Market or Industry	Market & Industry		3
I Road Classification		VR	MRL			4
Maximum RPI value						30

The State of Bihar has also adopted Road Priority Index (RPI) to select the roads for maintenance purposes. The entire rural road network of Bihar have been divided into two classes i.e. Class I and Class II.

Class I roads are those which connect/are

- a) Sub divisional office to District headquarter.
- b) Block office to sub divisional office
- c) Railway Station/ main Bus stop
- d) Two major roads (such as NH, SH, MDR) as Link Road
- e) Spots of Tourist Interest
- f) Through Route

Rest all remaining roads are kept under Class II category roads.

Priority of both Class I and II roads for maintenance purposes are fixed as follows:

Class I roads are prioritized on three parameters i.e.

a. Type of roads

Full Points 35

Sl. No.	Class I Roads	Points
1	Roads Connecting sub-divisional office to District headquarter	35
2	Roads Connecting Block office to sub-divisional office	30
3	Roads Connecting Railway Station	25
4	Roads Connecting Major roads (such as NH, SH, MDR) as link roads.	20
5	Roads Connecting Tourist Spots	15
6	Through Routes	10

b. Durations of construction of roads

Full Points 35

Sl. No.	Duration of Construction	Points
1	Period more than 10 years	35
2	Period more than 9 year and up to 10 years	30
3	Period more than 8 year and up to 9 years	25
4	Period more than 7 year and up to 8 years	20
5	Period more than 6 year and up to 7 years	15
6	Period more than 5 year and up to 6 years	10
7	Period up to 5 years	5

c. Length of roads

Full Points 30

Sl. No.	Length of Road in Km.	Points
1	Length of Roads more than 10 Km.	30
2	Length of Roads more than 7.50 Km. and up to 10 Km.	25
3	Length of Roads more than 5.0Km. and up to 7.50 Km.	20
4	Length of Roads more than 2.5Km. and up to 5.0 Km.	15
5	Length of Roads more than 1.0 Km. and up to 2.50 Km.	10
6	Length of Roads up to 1.0 Km.	5

Similarly Class II roads are prioritized for Maintenance purposes on two parameters such as:

a. Duration of construction of roads

Full Points 60

Sl. No.	Duration of Construction of Roads	Points
1	Period more than 10 years	60
2	Period more than 9 year and up to 10 years	50
3	Period more than 8 year and up to 9 years	40
4	Period more than 7 year and up to 8 years	30
5	Period more than 6 year and up to 7 years	20
6	Period more than 5 year and up to 6 years	10
7	Period up to 5 years	5

b. Length of roads

Full Points 40

Sl. No.	Length of Road in Km.	Points
1	Length of Roads more than 7.5 Km.	40
2	Length of Roads more than 5.0Km. and up to 7.50 Km.	35
3	Length of Roads more than 4.0Km. and up to 5.0 Km.	30
4	Length of Roads more than 3.0 Km. and up to 4.0 Km.	25
5	Length of Roads more than 2.0 Km. and up to 3.0 Km	20
6	Length of Roads more than 1.0 Km. and up to 2.0 Km	15
7	Length of Roads up to 1.0 Km.	10

IRC SP-20 pertaining to Rural Roads Manual has outlined prioritization criteria for providing connectivity. This criteria as per the Manual is termed as Utility Value (UV) of the habitation. Although, the criteria as stated

above pertains to prioritization for providing connectivity but it can also be extended to prioritization of the roads for the Annual Maintenance Plan. This prioritization in the form of relative weights of variables as per IRC SP-20 is shown in Table 5 below.

Table 5: Relative weights of variables

Sr. No.	Variables of the Habitation	Weightage of Variable						Percent of Weightage for the Group
		0	2	4	6	8	Maximum Weightage	
1	Population	Below 250	251-500	501-1000	1001-2000	Above 2000	8	16
2	SC/ST population	Below 25	26-50	51-200	201-300	Above 300	8	
3	Primary schools	Nil	One	More than one			4	34
4	Middle schools	Nil		One	More than one		6	
5	High schools	Nil			One	More than one	8	
6	Intermediate/ College	No				Yes	8	
7	Vocational school	No				Yes	8	
8	Dispensary	No		Yes			4	
9	Maternity and child welfare centres	No			Yes		6	18
10	Primary health centres/ Veterinary	No				Yes	8	
11	Police station	No			Yes		6	
12	Post office	No		Yes			4	
13	Electrified	No			Yes		6	22
14	Panchayat Headquater	No			Yes		6	
15	No. of days markets held	Nil	One day		Two or more days		6	6
16	Hilly/coastal area	No		Yes			4	4
Maximum Score							100	100

4.3.5 Updated Schedule of Rates

An exercise for review of the rates of individual items involved in maintenance activities shall be carried out by considering the prevailing market rates of labour, materials and machinery. These rates shall be fed into the analysis of individual items of maintenance as given in the Ministry of Rural Development's (MoRD) Standard Data Book (SDB). Alternatively, in case, schedule of rates of the state is to be followed for non-PMGSY works, then these rates shall be fed into the analysis of rates pertaining to the particular state.

4.3.6 Cost Estimate

Accurate cost estimates are essential when planning and managing road maintenance. Based upon the unit rates of individual items as per the market analysis as stated under Section 0 above and the details of road condition (both on and off carriageway) as compiled from the Road Condition Survey, the cost estimate shall be prepared. A format for the cost estimate for routine maintenance of a roads is depicted in Format D under Annex 1.

4.3.7 Prioritization for Annual Maintenance Plan

For a constrained budget as is normally the case the Rating score shall be worked out separately for RCI and RPI. Total Rating score shall be arrived at by adding the two by giving a higher weight age to RCI as compared to RPI, say, a ratio of 65 : 35. A lower Total Rating score shall indicate that the road is in a good condition and vice - versa.

Prioritization through determination of Pavement Condition Index (PCI)

The assessment of road condition for prioritization of maintenance activities can also be determined through the Pavement Condition Index (PCI) through simple methods as detailed below. However, these methods tend to be somewhat subjective and, hence, wherever possible, a more objective method for evaluating the road condition to help in prioritization of maintenance interventions as outlined in Section 4.3 above, be adopted.

Based upon the above rating the Road Condition is classified as Good/Fair/Poor and Maintenance Intervention/Treatment is defined as Routine Maintenance/Periodic Maintenance/Rehabilitation or Up-gradation respectively.

i. Measurement based on Visual Inspection only

The engineer is expected to rate the PCI by visual inspection of the pavement for each kilometre on a scale of 1 to 5 as per Table 6.



Table 6: *Measurement of PIC based on visual inspection*

Description of Surface Condition	Pavement Condition Index (PCI)
Very good	5
Good	4
Fair	3
Poor	2
Very poor	1

ii. Based on Riding Comfort

A jeep or car is driven at 50km/hr and the riding comfort noted for each kilometre. Based on 'Riding Comfort' while driving at the design speed of 50km/hr, the PCI is assessed as per Table 7.

Table 7: *Measurement of PIC based on riding comfort*

Riding Comfort at 50km/hr	Pavement Condition Index (PCI)
Smooth and pleasant to ride	5
Comfortable	4
Slightly uncomfortable	3
Rough and bumpy	2
Dangerous	1

iii. Based on Comfortable Driving Speed possible

The driver is instructed to drive at the most comfortable and safe speed possible on the road. The PCI is then assessed for each kilometre based on the Normal Driving Speed as per Table 8.

Table 8: *Measurement of PIC based on driving speed comfort*

Normal Driving Speed (km/hr)	Pavement Condition Index (PCI)
Over 40	5
30 to 40	4
20 to 30	3
10 to 20	2
Less than 10	1

Determination for PCI for a Road

In order to get the PCI of the road, the arithmetic mean of the condition assessed for each km is taken if the kilometre-wise PCI is varying within a short range. However, if the variation of PCI is large from section to section of the road under consideration, the road is to be divided into homogeneous sections and the arithmetic mean of PCI is taken for each section.

Annual maintenance plan (AMP) shall be prepared on the basis of above Total Rating to arrive at final ranking and road section prioritization.

Taking into consideration the budget availability first priority shall be given to Routine Maintenance of the network.

Based upon the funds earmarked for Periodic Maintenance the AMP shall be finalised accordingly.

4.3.8 Scheduling of Planning Activities

Management

- i. Exercise for **review of Yardstick Norms for routine maintenance** shall commence after the monsoon season is over and the process completed by 30th November. The norms as finalized shall be notified by 31st December and shall be applicable for the next financial year beginning 1st April. Even in case the norms do not require any change the extant norms shall again be notified by this date.
- ii. A **yearly review of the rates of individual items** involved in maintenance activities shall be carried out by considering the prevailing market rates as on 1st October of that year and the review shall be completed by 30th November. The rates so finalized shall be notified by 31st December.
- iii. A **Periodic Renewal Cycle** of 5 years (it may differ from state to state). In HP for road traversing altitude above 2000m (snow bound areas) it is 5 years and for roads traversing altitudes below 2000m (non-snow bound areas) is 6 years.

Field Units and Headquarters

- i. The road condition surveys shall commence immediately after the cessation of monsoons in October and completed by 15th November.
- ii. Data from the survey shall be uploaded on the Road Maintenance Management System (RMMS)/Road Management System (RMS) by the Divisional Offices by 1st week of December.
- iii. Results of the entire road network shall be generated by the PMGSY HQ staff by 31st December.

- iv. PWD HQ shall finalize the priority list for Annual Maintenance Plan (AMP) and disseminate the same to all field offices by 15th January. The field Executive Engineers on receipt of the approved AMP shall have another verification carried out to confirm that the roads appearing in the AMP with respect to their jurisdiction actually qualify for Periodic Renewal and revert back to the HQ by 31st January with full justification in case any substitution is required.
- v. Field offices shall initiate action for preparing estimates and inviting bids for works proposed to be contracted out for the approved chain ages of various roads immediately and works shall be awarded by 25th March.

Execution of maintenance programme

The execution of the maintenance programme shall commence by 10th April. However, for areas subjected to heavy snowfall such as the tribal areas where the working season normally starts in May end / June, the commencement of the maintenance plan shall take place accordingly.

Bituminous works

These works shall be so scheduled that they are taken up in the months of April, May and June in order that at least 70% of the work programme pertaining to bituminous items is completed by this time. The remaining bituminous works shall be scheduled to be taken up on the cessation of monsoons and completed preferably by mid-November.

Drainage Items

The work of cleaning/de-silting of roadside drains and cross-drainages shall be scheduled so as to be completed at least 10 days before the normal date of arrival of the monsoon. Subsequent cleaning of the drainage structures shall be ensured as and when required.

Annual Maintenance Calendar

The Annual Calendar of Road Maintenance Activities shall be as given in Table 9.

The calendar shown in the table for road maintenance shall be modified taking into consideration the topography, climatic conditions or any other features peculiar to a particular region.

Table 9: Annual calendar for road maintenance activities

Sr. No.	Item of Work	Intervention Standard	Response Time	Frequency	Remarks	
A	B	C	D	E	F	
1	Cleaning/desilting of road side drain/gutter					
	Water diverted out of drain onto roadway	Causing a hazard to traffic	Immediate	Thrice i) February ii) May and June iii) August and September and as and when required i.e. blockade more than one-fourth		
	Obstruction or Siltation impeding flow	Blocked by more than one-fourth of the size of the drain	14 days and prior to monsoon			
2	Pothole Filling					
	Collection of patch repair material for Bituminous roads			i) January and February ii) July and September		
	Collection of patch repair material for WBM repair			i) January and February ii) July & August		
	Pothole filling in Bituminous and rigid pavement with maximum dimension more than 200mm, cracks, edge breaks, ruts and depressions	All potholes ≤75mm depth Cracks >5mm in width Edge Breaks >150mm in width Ruts >50mm in depth Depressions >50mm in depth	21 days	Immediate on their occurrence		
	Pothole filling in WBM with maximum dimension >200mm	Depth > 75mm	21 days			
	Pothole filling in Gravel/ Katcha surface	Depth >50mm Width >300mm	45 days			
3	Filling edges of bituminous surfaces and replenishing/ lowering earthen/ hard shoulders	Difference more than (-) 50mm/ (+) 0mm			Before and after monsoons and as and when required i.e. when the requirements as specified are exceeded as per Column C	
4	Dressing of berms				Before and after monsoon and once in between i.e. February/March, June, August and September	
5	Restoration of rain cuts and side slopes			September and as and when required		
6	Cleaning of Cross-Drainages					
	Debris and silt reducing effectiveness of structure, broken or cracked structure causing instability, under mining or not functioning properly	Blocked by more than one-fourth of the size of the culvert opening	14 days	Twice (May and October) and as and when required i.e. blockade more than one-fourth of the opening		
	Deformation of culvert, its invert and alignment		45 days and prior to monsoon			
7	While washing of Parapets, Guide Stones, Tree Trunks etc.			Twice (April and October)		
8	Re-fixing disturbed caution boards, other signage etc.			Once and as and when required		
9	Re-fixing displaced Km. stones, 200m stones, guard stones, guard rails			Once and as and when required		
10	Cutting of branches of trees, pruning shrubs			Once (October)		
11	Removing wild seasonal growth on berms and from road side structures			Twice (March and September)		
12	Painting of Km. stones, Numbering of culverts, Road markings etc. including history of road on Km. stones			Once (April/ November)		
13	Maintenance of T & P	All round the year				
14	Removal of encroachment	All round the year				

4.4 INSPECTION¹

Physical Road inspection plays an important role to allow the officials to have first-hand ground information about the on-site road condition. Routine Inspections carried out by the officials play an important role in quality assurance in the execution of maintenance work. Inspections reduces the responding time to initiate maintenance activities to restore road damages and to plan emergency repairs. Inspection Notes generated as a result of such road inspections help the subordinate staff to take appropriate steps for improving the maintenance of the road.

Figure 4: Maintenance work inspection



In order to maintain the roads efficiently and economically officers/officials in charge of the roads must exercise the greatest care to see that money and materials are used to the best advantage. To achieve this frequent inspections are necessary and in this connection the following broad principles are laid down:

- The Mate/Work Inspector shall keep a strict watch on the condition of the entire stretch of road under his beat and cover the same daily.
- The Junior Engineer (JE) in charge shall inspect the entire road length under his jurisdiction at least once every week. He shall simultaneously verify at site the contents of the Daily Progress Report as maintained by the Mate/Work Inspector in his diary and initial the same.
- The Assistant Engineer (AE) in charge of the road shall ordinarily travel at the rate of 30 Km. per day and inspect the entire length under his jurisdiction at least once every month. He shall invariably be accompanied by the Junior Engineer in charge to whom he can give the necessary directions for repairs.
- The Executive Engineer (EE) shall also arrange to travel only moderate distance each day and shall be accompanied by the Assistant Engineer in charge. He shall inspect all the roads under his jurisdiction once every three months.
- The Superintending Engineer (SE) shall, whenever possible, be accompanied by the Executive Engineer. He shall plan his visit through alternate routes rather than following only the regular and direct route while going on/coming back from tour. This is necessary to ensure that

¹Standard Operating Procedure for Maintenance of Rural Road Network in H.P./IRC-82: Manual for Maintenance of Roads

alternate routes/interior roads get inspected even when the purpose/destination for the tour may be different. It may, therefore, be ensured that the officer does not undertake to and fro journey through the same route. He shall travel on alternate route on one of the journey.

- Every effort should be made to issue instructions verbally and with personnel consultation supplemented by notes in the notebook of the person to whom orders are given. This procedure will save time in writing long inspection notes.
- Superintending Engineer should be able to supplement the notes given in the notebooks with more precise orders.
- From the point of view of safety of traffic as well as from the point of view of safety of road structures, it is essential to pay special attention to the maintenance of road berms. The Inspecting officers should make special note of the condition of the berms and their improvement since last inspection and record the same in the notebook of the Junior Engineer and the Assistant Engineers.
- The Superintending Engineer shall also inspect the roads from overall road safety considerations and give appropriate directions.

4.4.1 Duties of Mate

The duties of Mate wherever Force Account/Departmental Labour is deployed are:

- (i) To report to Work Inspection/ Junior Engineer
- (ii) To mark daily attendance of labour working under him
- (iii) To help in the layout, marking, checking the quality and quantity of work done by the labour and get the work executed as per instructions
- (iv) To assist the Work Inspector/Junior Engineer in taking out the measurement for daily work done by labour
- (v) To display necessary caution boards for safety point of view as per standard layout
- (vi) To report to his senior about any causality, accident, encroachment of Government property or any type of serious damage to the Government property within his beat
- (vii) To maintain T & P and sign boards under his charge
- (viii) To carry out jobs of semi-skilled nature connected with his trade along with his gang
- (ix) General supervision over un-skilled labour
- (x) To get cement/composite mortar prepared in his presence as per instructions of Junior Engineer/Work Inspector
- (xi) To report about damages to structures, kilometre stone etc. and keeping them in position

- (xii) To comply with any instruction giving by his immediate superior
- (xiii) Daily labour report, D.L.R.
- (xiv) To ensure adequate quantum of work being done by gang and that it conform to norms
- (xv) To keep account of permanent articles, for example direction boards, trees, drums etc. in his beat
- (xvi) To ensure providing and proper upkeep of diversions.

4.4.2 Duties of Work Inspector

The duties of the Work Inspector are:

- (i) To report to Junior Engineer
- (ii) To maintain daily diary of the work done and to put up to the Section In-charge every alternate day
- (iii) To maintain daily receipt/daily consumption of material consumed
- (iv) To help in preparing estimates for minor works and repairs
- (v) To ensure execution of work according to specifications and drawings
- (vi) To take round of various bridges and roads under his charge on regular basis and report to section in charge about repairs to be done. He shall also assist to plan out a programme for such repairs in advance and ensure their execution through the department labour within the specified period
- (vii) To assist Junior Engineer in taking out measurement and distributing work to labour daily and checking their attendance
- (viii) To estimate and indicate rough quantities of materials required
- (ix) To take measurement of daily work done
- (x) To ensure adequate quantum of work being done by gang and that it conform to norms
- (xi) To maintain material at site account and account of traffic signs
- (xii) To report about unauthorized constructions and encroachments on government premises
- (xiii) To comply with the instructions giving to him by his immediate officer
- (xiv) To ensure submission of daily report
- (xv) To see that log books are filled daily for machinery and that machinery are parked properly
- (xvi) To maintain details of land width and check encroachments
- (xvii) To ensure proper maintenance of speed humps and caution boards including their painting.

4.4.3 Duties of Junior Engineers

The duties of the Junior Engineers are:

- (i) Inspection and supervision of works as per prescribed norms
- (ii) Recording the progress of both casual and regular labour in the Measurement Book (MB) and ensuring that the output of labour matches with the norms for task for labour
- (iii) No progress in measurement book be entered as 'unsusceptible to measurement' and progress of all activities be recorded
- (iv) Reporting observations to higher authorities
- (v) Preparing estimates for repairs after conducting condition survey of roads
- (vi) Reporting about closure of road/obstructions due to any of the following reasons:
 - a. Over toping/breach
 - b. Land slides
 - c. Earth quakes
 - d. Accident
 - e. Any other reason (specify)
- (vii) Arranging for removal of obstructions such as dead animals, trees and other debris lying on road
- (viii) Enumerating safety measures and restoration works in case of flood damages and breaches and reports on opening of traffic/completion of restoration.

4.4.4 Duties of Assistant Engineers

The duties of the Assistant Engineers are:

- (i) Inspection and supervision of works as per norms
- (ii) Reporting observations which suggestion for remedial action to higher authorities
- (iii) Getting estimate prepared and checked after conducting surveys and site investigations
- (iv) Reporting about heavy rain fall in the area and consequent rain damage
- (v) Enumerating action on the report of Engineering subordinates regarding obstructions, accidents etc.
- (vi) Enumerating safety measures and restoration of (both temporary and permanent) works in case of flood damages and breaches.

4.4.5 Duties of Executive Engineers

The duties of the Executive Engineers are:

- (i) Inspection and recording of observations as per prescribed norms

- (ii) Planning and finalization of nature of maintenance activities e.g. surface repair, prepare to CD works etc.
- (iii) Arranging men, materials and machinery in advance as per requirements
- (iv) Finalizing action on reports of Assistant Engineers and also on safety measures, diversion in case of breaches and flood damages
- (v) Coordination with various agencies like Traffic Police, Local Administration, Publicity Media etc., in case of emergent repair, interruption to traffic by road blockage, etc.
- (vi) Initiate steps for finalizing permanent restoration works.

4.4.6 Action to be taken in case the road is breached or blocked

Action to be taken by the Mate/Work Inspector

- (i) Immediate report of the road breach/blocked will be made to Junior Engineer and Assistant Engineer. The following points will be included in the reports:
 - a. Name of the road
 - b. Location of the breach/blockade
 - c. Length and nature of the breach/blockade
 - d. Date and time of occurrence
 - e. Assessment of the assistance in the form of men and material required
- (ii) “Road closed” boards and “Diversion” boards shall be fixed on both sides at 60 m distance in advance of the hazard
- (iii) Arrangements for red lights to be done in case of darkness
- (iv) Labour shall be deputed to guide the traffic to prevent any accident
- (v) Construction of diversion, if possible

Action to be taken by the Junior Engineer

- (i) He/she will at once visit the site of the hazard and shall ensure that:
 - a. Road has been closed by means of barricading with empty drums or any other means available at site
 - b. That caution and diversion boards have been fixed on both sides
 - c. Arrangements made to guide the traffic by posting gang men having red flags
 - d. Arrangements made for red lights and chowkidar etc.
 - e. Steps to stop further damage to the road are taken as per site requirement
 - f. Possibilities of construction of diversion to be explored. If possible the diversion should be constructed with available resources
- (ii) He/she shall immediately report to the Assistant Engineer, Executive Engineer and Superintending Engineer through fax regarding the road

breach, duration of blockade of the traffic followed by a detailed report containing:

- a. Name of the road
 - b. Location of the breach/blockade
 - c. Length and average depth of the breach
 - d. Date and time of occurrence
 - e. Duration of suspension of traffic
 - f. Requirement of men and material for restoration of traffic and road and the approximate cost
- (iii) All arrangements and efforts shall be made for restoration of traffic
- (iv) He will intimate the details of any losses and injuries to the public, if any, including the extent of compensation if payable

Action to be taken by the Assistant Engineer

- (i) He shall at once inspect the site of the hazard
- (ii) He shall inspect all safety measures taken by the Junior Engineer
- (iii) He shall ensure that the restoration of traffic is done at the earliest
- (iv) He shall send a detailed report regarding the breach/blockade enumerating all the points given “Action to be taken by the Junior Engineer” stated above. In addition to these he will also include the following points:
 - a. The causes of the breach/blockade
 - b. Forecast estimate for restoration of traffic and road
 - c. Remedial measures to avoid any future occurrence with forecast estimates
 - d. Any other information which he wants to include

Action to be taken by the Executive Engineer

- (i) He shall at once visit the site of breach. In case of multiple occurrences, he will inspect them in order of priority and importance
- (ii) He shall ensure speedy restoration of traffic
- (iii) He shall send a detailed report to the Superintending Engineer and Chief Engineer about the road damage indicating:
 - a. Nature and cause of damage with location
 - b. Proposals for remedial measures with financial implications
 - c. Nature and course of consequential damages to public properties etc.
 - d. Action taken for restoration of traffic and restoration of damages with financial implications
- (iv) He shall be fully responsible for all the action taken for the protection and safety of traffic and road.

4.5 REPORTING

- Junior Engineer (JE) while submitting reports as required under SOP should send timely information to AE in case of road getting breached resulting into disruption of traffic, especially in the monsoon season.
- Assistant Engineer (AE) should immediately report any new development requiring emergent maintenance of Road to EE, and should also apprise him about the steps taken for attending to emergent repairs in restoring traffic.
- Executive Engineer (EE) should ensure that necessary action on reports received from Sub Divisions are promptly taken and necessary instruction conveyed to the sub division for restoring traffic on the damaged road with in minimum possible time. He should also send necessary report regarding any damages caused to the road network to circle office.

4.5.1 Action Taken Report

- The JE is required to send the action taken reports, on the defects pointed out by the AE in his inspection note. In case of breach of road he should constantly update the AE about the daily progress. He should also bring to the notice of AE whenever any encroachment is made on the road land.
- The AE is expected to keep the division office in loop whenever any major damage disrupting traffic is caused to the road network. He should take immediate action to remove encroachments, by taking help from the District Administration.
- He should send also sent ATR on all the defects pointed out by the EE in his inspection notes.
- The EE should inform circle office in case any major damage to the road network is caused due to natural calamities and should ensure that the traffic restored on priority.
- EE should ensure that all data required for preparing Annual Maintenance Plan is received from the sub divisions to submit the AMP in time to circle office for timely allotment of funds and approval.

4.6 MONITORING²

Monitoring is required for successfully implementing a project. Monitoring enables the comparison of planned maintenance activities to their actual performance on site which includes keeping close watch on financial and physical targets. Monitoring also ensures that concerned officials perform

²Standard Operating Procedure for Maintenance of Rural Road Network in H.P.

their assigned duties with due responsibility. Finally monitoring allows the senior officers to review the ground implementation of maintenance works in their respective jurisdiction to take appropriate action to tackle any hurdles in its successful completion.

In order to ensure the desired progress in terms of physical and financial targets, it is essential to keep a close watch through monitoring of returns as well as through online monitoring.

Superintending Engineer in charge of field circle shall ensure that there is proper monitoring of all maintenance activities. He shall monitor the physical and financial performance through quarterly returns to be submitted to him by the Executive Engineers in the format as per Annex 2: Financial Progress of Routine Maintenance, Periodic Renewal and Special Repairs/Flood Damage Repairs by the 15th day of the calendar month immediately succeeding the quarter under report:

Name rural road :		PWD Dn.:			/ Sub Dn.:			
Kilometer: to		Date of preparing inventories:						
Date of upgrading: /		/						
Sr. No.	Particulars	KM						
		1	2	3	4	5	6	7
1	Year of Construction							
2	Year of last rehabilitation/Upgradation							
3	Crust thickness Equivalent (mm)							
4	Present wearing Coat (type)							
5	Type of shoulder							
6	X-section cutting/filling (ave. ht.)							
7	Junction							
8	Annual rainfall (mm)							
9	Traffic in year 2013-14							
10	Year of last periodical renewal.							
11	PCI (ending 2013-14)							
12	Year 2014-15							
	(a) P.C.I. recorded							
	(b) Routine Maintenance done							
	(c) Periodical Maintenance done							
	(d) Rehabilitation done							
	(e) Traffic survey							
	(f) Annual rainfall (mm)							
13	Year 2015-16							
	(a) P.C.I. recorded							
	(b) Routine Maintenance done							
	(c) Periodical Maintenance done							
	(d) Rehabilitation done							
	(e) Traffic survey							
	(f) Annual rainfall (mm)							
14	Year 2016-17							
	(a) P.C.I. recorded							
	(b) Routine Maintenance done							
	(c) Periodical Maintenance done							
	(d) Rehabilitation done							
	(e) Traffic survey							
	(f) Annual rainfall (mm)							

Road Condition Inventory				Road Name:										
				Road Category:		Length:				km				
District:				Project:		Page:		of						
Division:				Chainage										
Sub-division:				+000	1	2	3	4	5	6	7	8	9	0
Existing Road Condition	Cross Section Type (1, 2, 3)													
	Carriageway width			m										
	Embankment height			m										
				Type	Condi.	Description								
	Subgrade													
	Subbase													
	Base													
	Surfacing													
	Side drains left (depth)			m										
	Side drains right (depth)			m										
Culvert/small bridge			no.											
Proposed Maintenance Activities			Unit	Q-ty										
Left side	Bush clearing (width)			m ²										
	Clear side drains (silted up to 50%)			m										
	Clear side drains (silted up to 100%)			m										
	Excavate cross drains(depth<30cm)			m										
	Lower berm			m ²										
	Shoulder repair (-50mm)			m ²										
	Side slope cutting repair			m ²										
Carriageway	Pothole repair (area)			m ²										
	Crack sealing (crack > 5mm)			m										
	Crocodile crack (area)			m ²										
	Edge break (width)			m ²										
	Revelling (area)			m ²										
	Depression (area)			m ²										
Right side	Bush clearing (width)			m ²										
	Clear side drains (silted up to 50%)			m										
	Clear side drains (silted up to 100%)			m										
	Excavate cross drains(depth<30cm)			m										
	Lower berm			m ²										
	Shoulder repair (-50mm)			m ²										
Structures	Clear culvert/small bridge			m ³										
	Clear inlets and outlets			m ³										
	Repair culvert/small bridge			no.										
	Repair road signs			no.										
	Maintenance of Kilometre stone			no.										
	Maintenance of 200 m stones			no.										
	Maintenance of Parapets			no.										
	Maintenance of Guard stones			no.										
Date:				Date:				Date:						
Surveyed by:				Checked by:				Counter-signed by:						

Cost Estimate for Routine Maintenance of Rural Roads							
District :				Division :			
Sub-Division :				Road Category :			
Road Name :						Length :	
Sr. No.	Activities	Unit	Quantity	Unit Rate (in Rs.)	Amount (in Rs.)	No. of Times / Year	Total Amount (in Rs.)
1	Pothole repair	sqm					
2	Crack sealing	m					
3	Crocodile crack	sqm					
4	Edge break	sqm					
5	Revelling	sqm					
6	Depression	sqm					
7	Bush clearing	sqm					
8	Clear side drains (silted 50 %)	m					
9	Clear side drains (silted 100%)	m					
10	Lower berm	sqm					
11	Excavate cross drains (depth, 30cm)	m					
12	Shoulder repair (-50mm)	sqm					
13	Slide slope cutting repair	sqm					
14	Clear culvert/small bridge	cum					
15	Clear inlet and outlet of culverts	cum					
16	Repair culvert/small bridge	no.					
17	Maintenance of road signs	no.					
18	Maintenance of Kilometre stones	no.					
19	Maintenance of 200m stones	no.					
20	Maintenance of Parapets	no.					
21	Maintenance of Guard stones	no.					
Total							
Add 3% contingencies charges							
Grand Total							

Note: Some activities need to be carried out several times in a year

FIELD DATA SHEET FOR TRAFFIC CENSUS										
Name of Road :										
Location on Road :										
District :										
State :								Date :		
Hour	Vehicle Class									Remarks Season: Post Harvest
	Animal Drawn Vehicles	Cycles	Cycle Rickshaws	Motorized two-wheelers	Cars, Jeeps, Vans, Three-wheelers	Agricultural Tractors/Trailers	Light Commercial Vehicles	Trucks	Buses	
From Hrs.										
To Hrs.										
From Hrs.										
To Hrs.										
From Hrs.										
To Hrs.										
From Hrs.										
To Hrs.										
Total for day										

Note: Record traffic volume by tally marks [four vertical strokes followed by a diagonal stroke for the 5th vehicle]

Traffic Census - Abstract										
Name of Road :										
Location on Road :										
District :										
State :										
	Vehicle Class									
Day	Cars, Jeeps, Vans, Three-wheelers	Motorized two- wheelers	Light Commercial Vehicles	Trucks	Agricultural Tractors/trailers	Buses	Cycles	Cycle Rickshaws	Animal Drawn Vehicles	Total
Day 1										
(date)										
Day 2										
(date)										
Day 3										
(date)										
Total										
Average Daily Traffic										
PCU Factor	1.0	0.5	1.5	3.0	1.5	3.0	0.5	2.0	4.0 for horse drawn 6.0 for bullock drawn	
Average Daily Traffic PCUs										

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