

ROAD MAINTENANCE MANAGEMENT SYSTEM

The PMGSY programme started construction activities about fifteen years ago. A large number of roads have since completed 5-year post construction maintenance contract and are now under routine and periodic maintenance. In the years to come, more quality rural roads will need to be adopted into a well-managed maintenance system in order to protect these investments and thereby sustain the benefits of this new generation of rural roads.

Sound asset management principles need to be introduced as an integral part of rural road policies and maintenance programmes thereby protecting investments already made in improving rural roads. A structured approach to planning is a key component of any effective maintenance management system. The planning process needs to be followed up by effective arrangements for implementing the works.

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

Some states have made good efforts in establishing sound maintenance management systems, some of which are fully computerised. There is no lack of competence to operate such systems. In many places however, the challenge seems to be in sustaining the commitment to operating a programme based on a systematic approach to maintenance based on sound asset management principles. In this context, experience clearly show that sound management procedures are not dependent on technology but on the political will and discipline in the relevant agencies to pursue a maintenance approach that give priority to protecting existing road assets.





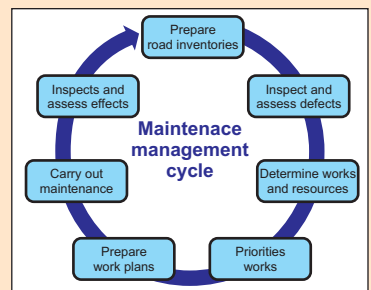
In the Vision 2025 document it was acknowledged among others that maintenance management system is identified as one of the most critical issues to be addressed for ensuring maintenance of rural roads on a sustainable basis.

Well planned maintenance system is a prerequisite for a good road network and maintenance system should assess the followings which will help in prioritisation of maintenance of the road network:

- Actual condition of both carriage way and the off- carriage way
- Traffic plying on the road
- Importance of the road

Like any civil works, road maintenance requires careful planning, supervision and control. It may be divided in two parts such as:

- Preparation of annual maintenance plan
- 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.

Annual Maintenance Plan

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

Road Inventory Survey

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.

Inventories of each rural road in division/district may be prepared once in Format – A

INVENTORY OF RURAL ROADS																FORMAT : A					
A: REFERENCE DATA																					
STATE:				CODE:			DISTRICT:				CODE:			BLOCK:			CODE:				
B: Provide following details of all type of RURAL ROADS in the block																					
Sr. No.	Name of Road	Road Code	Category of Road ODR/MR/ others	Length (km) (Ex. 12.935)	Predominant Soil Type	Terrain Type	Width (m)			Length (Km) with surface Type						Existing CD Works			List of Hebitation on the Road		
							Road Land Width	Formation Width	Carriageway Width	BT	WBM / Metal	Earthen	Gravel	All - Weather Road (AWR) or Fair Weather Road (FWR)	Condition Rating (PCI)	Number	Type	Total Length (Waterway span) width (m)	Habitation code		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
																	CD 1				H 1
																	CD 2				H 2
																	CD 3				H 3
Certification: Certified that the above information is correct							Name:				Designation:					Signature:					



Update of inventories done every year, depending on local conditions, in Format – B.

Format B

Name Rural Road:		PWD Dn.:			/ Sub Dn.:			
Kilometer:		to			Date of preparing inventories:			
					Date of Upgrading			
Date of Upgrading		(km)						
Sr. No	Particular	1	2	3	4	5	6	7
1	Year of construction							
2	Year of last rehabilitation / Upgradation							
3	Crust thickness equivalent in mm							
4	Present wearing coat (type)							
5	Type of shoulder							
6	X- section cutting / filling (av. ht.)							
7	Junction							
8	Annual rainfall (mm)							
9	Traffic in year 201-14							
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							
13	Year 2015-16							
	(a) P.C.I. recorded							
	(b) Routine maintenance done							
	(c) Periodical maintenance done							
	(d) Rehabilitation done							
	(e) Traffic survey							
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 Survey

Road condition surveys allow 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,
- 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 be minimal and collected through visual inspection and/or with horizontal straight edge and ruler. Classify the data under various headings namely, GOOD, FAIR and POOR with rating assigned to each classification. The time it takes to carry out the surveys depends on the condition of the road.

Format C

Road Condition Inventory and Maintenance Planning				Road: Village A to Village B										
				Div. _____					Page _____ of _____					
				Last major intervention month / year _____										
				Chainage _____										
Road inventory data and condition assessment				Road: Village A to Village B										
				Cross section type	0+000 1: 2: 3: 4: 5: 6: 7: 8: 9+1+000									
				Carriageway width	m									
				Embankment height	m									
				Embakment height	Type	Cond.								
						G/F/P								
				Subgrade										
				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	Description									
Left side	Bush cleaning (width)	m	700		2.0									
	Clear side drain (depth)	m	500		0.30									
	Clear mitre drain (depth)	m	150		0.30									
	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												
	Ligth grading	m2												
	Camber reshaping	m2												
Righth side	Bush cleaning (width)	m	500		2.5									
	Clear side drain (depth)	m												
	Clear mitre drain (depth)	m												
	Shoulder repair	m	600											
	Side slope reapiir	m												
Shoulders, road furniture other	Culvert / head wall repair	m												
	Repair retaining wall													
	Minor bridge repair													
	Repair of road signage	no												
	Replacement of road signage	no												
	Road marking repair	m												
	Road marking renewal	m												
Surveyed By:			Date:			Checked By:			Date:					

Proposed Road Condition Index (RCI)

Format D

Road Condition Rating Calculation Chart					
Defect Type		Percentage of Damage			
Name	Criteria	1	2	3	Maximum
Rating		Good	Fair	Poor	
Road condition		<1	1-2.5	>2.5	6
Potholes	All	<1	1-2.5	>2.5	3
Edge Breaks	More than 150mm in width	<1	1-2.5	>2.5	3
Ruts and Depressions	More than 50mm in depth	<1	1-2.5	>2.5	2
Cracks	More than 5 mm in width	<1	1-2	>2	3
Pavements Failure	All	<1	1-2	>2.5	3
Height of shoulders vis-a-vis Pavement	Difference more than (-) 50mm / (+) 0mm	<1	1-2	>2.5	3
Maximum RCI Value					20
Rating Score		<8	≤15	>15	
Maintenance Required		Routine	Periodic	Rehabilitation	

Note: Provide weightage of 2 for <1; 4 for 1-2.5; 6 for >2.5 under item potholes

Traffic Survey

In several cases the rural roads provide alternative and shorter route to other destination and such transfer of additional traffic is not anticipated in design data of rural roads. Socio-economic growth as a result of rural road connectivity also results in traffic growth. Traffic survey is required once in two years in Format E and F for planning rural road maintenance.

Format E

FIELD DATA SHEET FOR TRAFFIC CENSUS										
Name of Road										
Location on Road		Km								
District										
States										
Hours	Animal Drawn Vehicles	Cycles	Cycles Rickshaws	Motorised 2 wheelers	Cars, Jeeps, Vans, Three wheelers	Agriculture Tractors / Trailers	Light Commercial Vehicles	Trucks	Buses	Remarks season post Harvest
From Hrs										
To Hrs										
From Hrs										
To Hrs										
From Hrs										
To Hrs										
From Hrs										
To Hrs										
Total for day										

Record traffic volume by tally marks (vertical stokes followed by a diagonal stroke for the 5th vehicle

Traffic Census - Abstract										
Name of Road										
Location on Road		Km								
District										
States										
Day	Cars, Jeeps, Vans, Three wheelers	Motorised 2 wheelers	Light Commercial Vehicles	Trucks	Agriculture Tractors / Trailers	Buses	Cycles	Cycle Rickshaws	Animal Drawn Vehicle	Total
Day 1 (Date)										
Day 2 (Date)										
Day 3 (Date)										
Total (Date)										
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										

Proposed 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,
- 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 be given to the traffic volume

Format G

Road Priority Index					
Indicator		Rating			
		0	1	2	Maximum
1	Traffic (PCU)	<100	100-200	More than 200	4
2	Terrain	Plain/Rolling	Hilly	Mountainous	2
3	Rainfall	<750mm	750 and above		1
4	Education Facility	No	Yes		2 *
5	Health Facility	No	Yes		
6	Market	No	Yes		
7	Industry	No	Yes		
8	Tourist / Religious	No	Yes		
9	Road Classification	No	MRL		1
Maximum					10

Note: * Give score of 1 for road fulfilling any one of the items from 4 to 8

* Give score of 2 for road fulfilling two or more of the items from 4 to 8

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 payment 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. 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 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.

Scheduling of Planning Activities

Management

- Exercise for review of Yardstick Norms for routine maintenance
 - Commence after monsoon and complete by end November
 - Notify revised norms by end December
 - Norms to be effective from 1st April of next financial year
- An yearly review of the rates of individual items
 - Commence the exercise from beginning of October and complete by end November
 - Notify the rates so finalised by end December
- A Periodic Renewal Cycle of 5 years or otherwise be notified. This can be reviewed subsequently based upon the results of the Maintenance Management System over a period of time.

Field Units and Headquarters

- Road condition surveys
 - Commence immediately after the cessation of monsoons in October and complete by 15th November.
 - Data from the survey shall be uploaded on RMMS / RMS by the Divisional Offices by 1st week of December.
 - Results of the entire road network shall be generated by the PMGSY HQ staff by 31st December.
 - PWD HQ shall finalize the priority list for Annual Maintenance Plan (AMP) by 15th January

- The field Executive Engineers on receipt of the approved AMP shall 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.
- 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.

Updated Schedule of Rates

- An exercise for review of the rates of individual items involved in maintenance activities shall be carried out 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 (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.

Format H

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	Side 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 to be carried out several times in a year

Accurate cost estimates are essential when planning and managing maintenance road Based upon the unit rates of individual items as per the market analysis and the details of road condition (both on and off carriageway) as compiled from the Road Condition Survey, the cost estimates shall be prepared by 15th January.

A format for the cost estimate for routine maintenance of a road is depicted in Format-H.

Annual Maintenance Calendar

The Annual Calendar of Road Maintenance Activities shall be as given in adjoining Table. The calendar shown in the table for road maintenance shall be modified taking into consideration the topography, climatic conditions or any other features specific to a particular region.

Sr. No.	Item of work	Intervention Standard	Response Time	Frequency
A	B	C	D	E
	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 - June (iii) August - September and as and when required i.e. blockade more than one-fourth
	Obstruction / siltation impeding flow	Blocked by more than one-fourth of the size of the drain Block 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 -February (ii) July - September
	Collection of patch repair material for WBM repair			(I) January -February (ii) July - September
	Pothole filling in Bituminous and rigid pavement with maximum dimension more than 200mm, cracks, edge breaks, ruts and depressions	All Potholes \leq 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 Pothole filling in Gravel / Katcha surface	Depth $>$ 75mm Depth $>$ 50mm Width $>$ 50mm	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	Depressing of berms			Before and after monsoons 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 - October) and as 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 parapets, Guide stones, Tree trunks etc.			Twice (April and October)
8	Re- fixing disturbed caution board, other signages etc.			Once and as and when required
9	Re- fixing disturbed 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. stone			Once (April/ November)
13	Maintenance of T & P		All round the year	
14	Removal of encroachment		All round the year	

The ultimate aim is to maintain the road network at the desired service level through an effective and transparent maintenance management system which ensures regular routine maintenance of both off-carririgeway and on-carriageway and a judicious prioritization of roads for periodic renewal.



International
Labour
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NRRDA



सत्यमेव जयते

Ministry of Rural Development
Government of India

**PRADHAN MANTRI
GRAM SADAK
YOJANA**



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