

## RURAL ROAD MAINTENANCE

The basic objective of road maintenance is to ensure the road that has been constructed or improved, is to the extent possible kept in its original condition. All roads require maintenance as they are subjected to traffic and the forces of weather. Even with the highest possible quality of construction, maintenance is essential to get optimum service from the road structure during its design life.

The purpose of road maintenance is to ensure that the road remains serviceable until the end of its design life. Maintenance therefore performs the important function of:



- Prolonging the life of the road by reducing the rate of deterioration (both on-carriageway as well as off-carriageway), thereby safeguarding previous investments in construction and rehabilitation;
- Lowering the cost of operating vehicles on the road by providing a smooth running surface;
- Keeping the road open on a continuous basis by preventing it from becoming impassable.

Road maintenance comprises activities to keep pavement, shoulders, slopes and drainage facilities and all other structures and property within the road margins as near as possible to their “as-constructed” or renewed condition. It includes minor repairs and improvements to eliminate the cause of defects and to avoid excessive repetition of maintenance efforts. For management and operational convenience, road maintenance is categorized as either routine, periodic, and emergency/urgent.

**Routine Maintenance** is required continuously on every road whatever its engineering characteristics or traffic volume. Routine maintenance activities are usually small-scale, widely dispersed, and often performed using manual labour. The need for routine maintenance to a large degree can be forecast and is scheduled at fixed time intervals during the year. Routine maintenance should be carried out on every road regularly to prevent premature deterioration of the roads and it is the responsibility of the engineers to ensure that funds are budgeted in the annual maintenance plan. The frequency of activities varies. Routine maintenance activities are further defined as either cyclic or reactive, although the distinction between these terms is not always very clear.

**Cyclic activities** are performed at predetermined intervals throughout the year purely as a preventive measure because of events we know will occur (e.g. cleaning drains before and during seasonal rainfall).

**Reactive activities** are performed in response to a triggering condition that requires action before the problem gets out of hand (e.g. blocked culvert, crack sealing and pothole patching).

Maintenance activities are also categorised based on where the works are located:

**Off-carriageway works** consist of maintaining shoulders and drains, including repairs to drainage and other structures in the roadside area, side slopes and all surface areas within the road reserve. Most off-carriageway maintenance is normally a routine activity, although occasionally some major overhauls are required.



**On-carriageway works** relate to road pavement and surface repairs. This work mainly consists of maintaining a good running surface on the road, free from any obstructions and damage and with the necessary camber or cross-fall to secure proper surface drainage.

### Prioritizing Routine Maintenance Work Activities

The priority of activities for routine maintenance may differ from area to area according to the prevailing conditions. Roads through mountainous areas are prone to landslides and washouts during intense rains and need regular inspections during this period. Equally, in flood prone areas, the proper functioning of cross-drainage structures is vital to the protection of the road embankment from overtopping and washouts. When priorities are set, the climatic conditions must be considered. Certain activities are more important during the rainy season while others are best carried out during the dry periods of the year. Obviously, good management of the roads would suggest that the drainage system is in good order before the rains commence. During the rainy season, it is crucial to ensure that the drainage functions as intended. Concrete and bituminous works are best carried out during the dry season.

## Routine Maintenance Activities

Routine maintenance of rural roads can be carried out by local labour for off-carriageway work activities while the on-carriageway work activities are carried out by experience contractors. The following table provides a list of priorities for routine maintenance according to the weather seasons.

Season	Priority	Maintenance Activity	Where
<b>Before the rainy season</b>	1	▪ Clean culvert and other cross-drainage	Off-carriageway
	2	▪ Clean side drains and mitre drains	Off-carriageway
	3	▪ Clean and repair shoulders	Off-carriageway
	4	▪ Repair erosion on side drain slopes and in drains	Off-carriageway
	5	▪ Patch potholes and seal cracks	On-carriageway
	6	▪ White wash road furniture	Off-carriageway
<b>During rainy season</b>	1	▪ Inspect and remove obstacles from roadway and drains	On/Off-carriageway
	2	▪ Clean culverts and other cross drainage	Off-carriageway
	3	▪ Clean side drains, cut-off drains and mitre drains	Off-carriageway
	4	▪ Repair side drain erosion	Off-carriageway
<b>End of rainy season</b>	1	▪ Repair erosion on shoulders, side slopes and in drains	Off-carriageway
	2	▪ Repair retaining walls	Off-carriageway
	3	▪ Cut grass and clear bush	Off-carriageway
<b>During dry season</b>	1	▪ Repair drainage structures	Off-carriageway
	2	▪ Repair road shoulders and surface/carriageway edges	On/Off-carriageway
	3	▪ Patch potholes and seal cracks	On-carriageway

### RM-01.01: Cleaning culvert, inlets and outlets

This activity includes clearing and cleaning of debris, sand and silt, vegetation of the culvert openings and catch-water pits without causing damage to any part of the structure. Cleared materials should be disposed off at least 3m clear of the road and the drainage system downhill from the road or as directed by the Engineer.



### RM-01.02: Clearing debris at bridges and causeways



This activity includes clearing of silt, debris and litter around the structure, its abutments and piers and for a minimum distance of 25 metres both up stream and down stream thereby allowing water to flow freely and unhindered. All matter should be removed clear of the river and the drainage system to prevent it from being washed back into the waterway.

### RM-01.03: Clearing, cleaning, reshaping, deepening and erosion repairs to side drains, mitre and catch-water/cut-off drains

This activity includes cleaning of debris and siltation from side ditches and turnouts/mitre-drains, cut-off/catch-water drains including minor reshaping to restore bottom level and gradient in order to ensure free flow of water collected from the roadway. These drains should retain its intended cross sections and grades as directed by the Engineer. This activity shall only proceed after grass cutting/bush clearing on the same section of the road has been completed and inspected.



### RM-01.04: Repair of damaged drain lining



This activity includes provision of construction materials and repair of damaged drain lining to its intended shape and specification as directed by the Engineer. The masonry work shall be cured for at least 4 days.

### RM-01.05: Repair and replace scour checks

This activity includes repairing, replacing damaged or severely eroded scour checks and construction of new scour checks using wooden stakes and/or boulders as directed by the Engineer. This activity shall only proceed after ditch maintenance activities on the same section of road have been completed, inspected and approved.



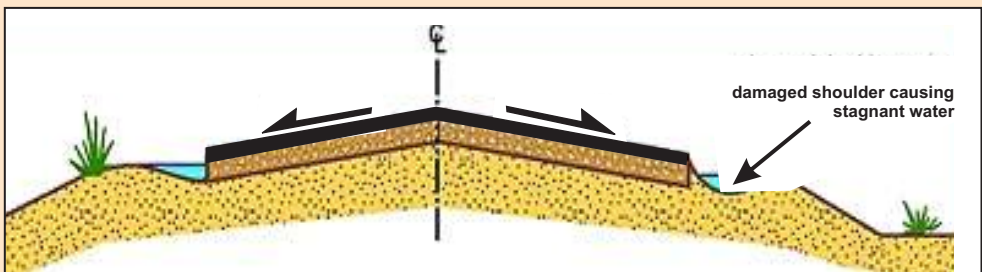
## RM-01.06: Repair rain cuts and minor slips on embankment side slopes

This activity consists of earth work for restoration of rain cuts in embankments side slopes. This activity should normally be preceded by (first removing the cause) reshaping the shoulders and filling in ruts. Damages to side slopes may also take place as a result of too steep slope gradients or poorly compacted fills. Steep slopes can be adjusted to achieve a gentle slope. If there is no available space, the alternative is to build a short retaining wall/ toe wall (extra work).



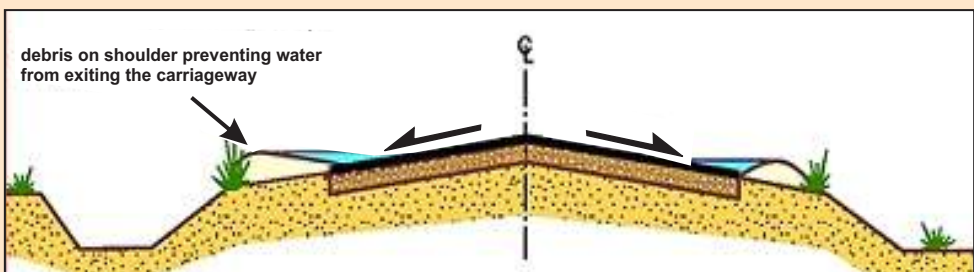
## RM-01.07: Earthen shoulder repair

This activity includes making up the irregularities/loss of material such as erosion gullies and potholes on shoulder to design level and cross-fall by adding fresh approved selected soil and compacting it with appropriate equipment or hand rammer as per the requirement as directed by the Engineer. If the shoulders are not kept intact at the level of the surfacing, the edge of the surfacing will start to break off and more extensive repairs are required.



## RM-01.08: Reshape shoulder

This activity includes removing excess material on the shoulders. Excess material on the shoulders blocks run-off from the carriageway. Water then ponds on the edge of the road and penetrates and softens the pavement and shoulders and cause pavement and shoulder failures.



### RM-01.09: Cutting of tree branches and shrubs



This activity includes cutting of tree branches and shrubs from roadway including disposing of all cuttings to suitable locations as directed by the Engineer. Cut all branches of trees extending above the roadway as to provide a clear height of 5m above the road surface and shoulders.

### RM-01.10: Trimming of grass and weeds

Trimming of grass and weeds from roadway or within the road reserve including disposing of all cuttings to suitable locations as directed by the Engineer. However, the grass roots should not be removed (grubbing) to protect from erosion in the drains and slopes.



### RM-01.11: Planting grass for erosion protection



The activity includes furnishing and planting turf and sods, achieving a healthy stable covering of grass which will maintain its growth in any weather. This is to prevent erosion of the material in which it is planted and stability of side slopes and embankments.

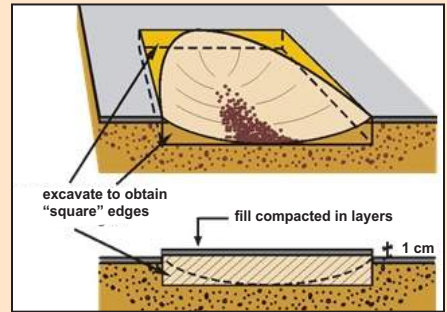
### RM-02.01: Light grading of unsealed roads (gravel roads)

This activity is done by using mechanical means where the surface of gravel roads are graded to remove corrugations, shallow ruts and potholes and minor defects to maintain and restore a smooth riding surface of the camber. Maintaining a proper camber of minimum 5% to 6% on gravel roads is crucial to their performance and will drastically reduce development of potholes, ruts and shoulder erosion.

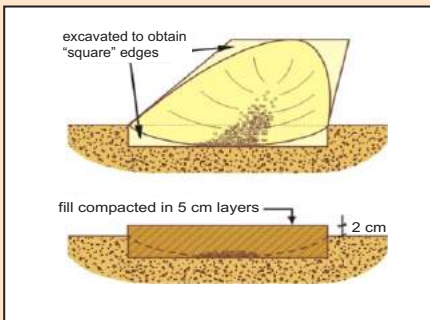


## RM-02.02: Bituminous pavement repair including filling of potholes and patch repairs

This activity includes the removal of all failed material in pavement courses up to the affected depth including the root cause of failure, the trimming of the compacted excavation to provide firm vertical faces; back filling of excavated area in layers to the specification as per the original construction; application of prime/tack coat on the base and the sides of excavations prior to placing of any bituminous materials and compact, trimming and finishing of the surfaces of all patches to form a smooth continuous surface, level with the surrounding road.



## RM-02.03: Carriageway repair including filling of potholes and minor reshaping of gravel roads



This activity includes the removal of all failed material in gravel and base courses up to the affected depth including the root cause of failure, the trimming of the compacted excavation to provide firm vertical faces; back filling of excavated area in layers to the specification as per the original construction; trimming and finishing of the surfaces of all patches to form a smooth continuous surface, level with the surrounding road.

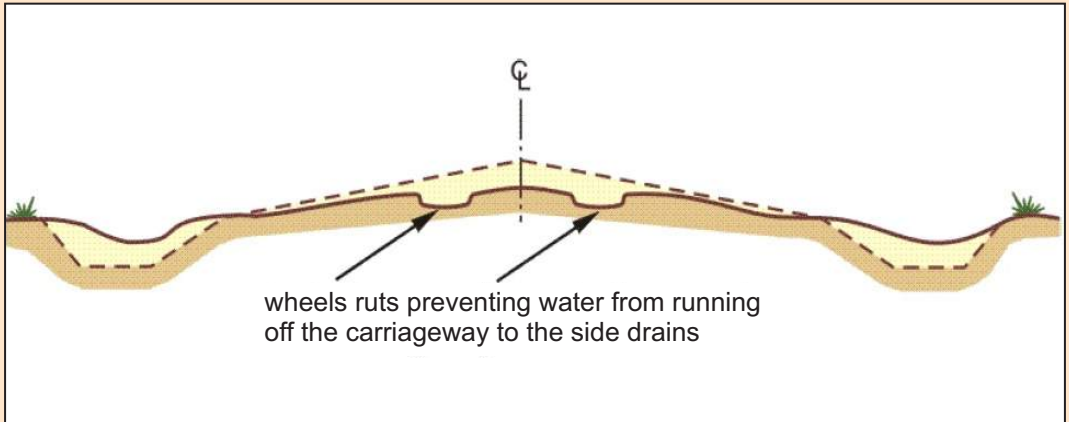
## RM-02.04: Repair of minor ruts and depressions on bituminous roads

This activity includes filling of minor ruts and depressions on paved roads (10mm < rut depth < 50mm). Minor ruts and depressions are often associated with cracks. Water in the ruts and depressions will penetrate into and weaken the pavement and accelerate the pavement deterioration. Minor ruts and depressions are best repaired with cold mix asphalt produced on site in the exact quantity needed. If wet weather is predicted and imminent, no asphalt work must be attempted.



### RM-02.05: Repair of ruts and depressions on gravel roads

This activity includes filling of ruts and depressions on gravel roads by replacing or adding fresh approved material and compacting with appropriate equipment as per the requirements of this specification and as directed by the Engineer.



### RM-02.06: Local sealing / Surface patching

This activity is done at the final stage of pavement repairs and repair of ruts and depressions, but can also be used to seal closely spaced hairline cracks in the surface. The seal prevents water from penetrating the surface and development of more serious pavement failures.



### RM-02.07: Crack sealing on bituminous roads



Sealing of fine cracks < 3 mm wide (frequent and closely spaced cracks within a limited area), can be carried out by applying a fog seal to the damaged surface, consisting of a light application of low viscosity slow setting emulsion.

For sealing large cracks > 3 mm wide a slow setting emulsion can be used for sealing. Wide and deep cracks can be filled with crusher dust before filling the top 5mm below the road surface level with emulsion.



## RM-02.08: Improvement of surface texture

This activity is done by applying sand or chippings to areas that exhibit bleeding and fatting-up. This deficiency can be attained by the following methods:

**Sanding:** Apply coarse sand on areas with mild bleeding or fatting up. Allow traffic to embed the sand into the binder. The treatment may have to be repeated.

**Spread heated chippings:** On areas with excessive bleeding, spreading heated chippings of nominal size 6 to 10 mm is more effective due to the amount of binder. The chippings can be heated in a tray over open fire and rolled into the bitumen for proper embedment.



## RM-02.09: Profile corrections / Reshaping of gravel roads



This activity is usually only carried out as a routine maintenance measure on gravel and WBM roads and often together with removing wheel ruts. Rural roads are often and built in stages leaving a time gap between the construction of the base course and the final surfacing works. During this period, the unsealed surface needs to be kept free of ruts, potholes as well as maintaining the camber and longitudinal

profile. Major profile correction works are normally included in the periodic maintenance programme.

## RM-02.10: Maintenance of culverts and causeways structure

This activity consists of repairs to cracks, parapets, protection works and invert of culverts and in case of causeways minor pavement surface repair, replacing guide posts, repairing flood gauges and protection works.



## RM-02.11: Maintenance of road furniture

This activity consists of cleaning or repainting of mandatory/regulatory, cautionary/ warning, informatory sign boards, re-fixing of tilted Kilometre / 5th KM / 200 M stones along with their repainting. These minor damages to road furniture if not attended to promptly would compromise on road safety.



## Conclusion

Roads are among the most important public assets. Road improvements bring immediate and sometimes dramatic benefits to road users through improved access to hospitals, schools, and markets; improved comfort, speed, and safety; and lower vehicle operating costs. For these benefits to be sustained, road improvements must be followed by a well-planned program of maintenance. Without regular maintenance, roads can rapidly fall into disrepair, preventing realization of the longer term impacts of road improvements on development, such as increased agricultural production and access to services.

Postponing road maintenance results in high direct and indirect costs. If road defects are repaired promptly, the cost is usually modest. If defects are neglected, an entire road section may fail completely, requiring full reconstruction at three times or more the cost, on average, of maintenance costs.

## Reference:

Module 7: Routine Maintenance Work Method, Rural Road Maintenance Training Modules for Engineers and Contractors, Ministry of Rural Development, Government of India.





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