119.13

*NO.RW/NH-11038/3/93-DO.I* *Dated the 8th August, 1994*

To

The Secretaries (dealing with National Highways), Public Works Departments of all States & Union Territories, Director General, Central Public Works Department, Secretary, Border Roads Development Board

Subject: Updated norms for maintenance of National Highways

I am to refer to this Ministry's letter No.RW/NH-11038/2/92-DO.I dated 13.4.1993 enclosing therewith updated norms for maintenance of State roads finalised by the Committee on norms for maintenance of roads. That Committee had, inter-alia, recommended separate group to consider the norms for maintenance of roads in hilly regions. A copy of the report finalised by the Committee on norms for maintenance of roads in hilly areas was also sent to the State Governments vide Ministry's letter No.RW/NH-11038/1/93-DO.I dated 26th July, 1993 for assessing the requirements of maintenance funds for State roads and projecting the same to the 10th Finance Commission.

2. The norms settled for State Highways in the above reports have now been made applicable to National Highways also. I am, accordingly, enclosing a copy of the above reports for your information and necessary action. It is, therefore, requested that in future the estimates for maintenance of National Highways may be projected on the basis of these norms.

119/2

# REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN HILL AREAS

GOVERNMENT OF INDIA
MINISTRY OF SURFACE TRANSPORT
(ROADS WING)
JUNE 1993

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# MINISTRY OF SURFACE TRANSPORT
## (ROADS WING)

D.K. GUPTA
(CHAIRMAN, COMMITTEE ON NORMS
FOR MAINTENANCE OF ROADS IN HILLY AREAS)
ENGINEER-IN-CHIEF,
U.P. P.W.D.

***No.RW/NH-11038/1/93-DOI*** ***Lucknow, Dated the 8th July, 1993***

Subject: COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN HILL AREAS

Dear Sri Bagla,

Kindly refer to the Ministry of Surface Transport Order No.RW/NH-11038/2/92-DOI dated 16.3.93 on the above mentioned subject vide which a Committee was set up to recommend norms.

2. I have great pleasure in submitting the report of the Committee on Norms for maintenance of roads in hill areas. The report brings out separate norms for roads in hill areas to the price level of 1992-93, recommendations for monitoring of funds for maintenance and suggests methodology and approach for updating and its periodicity for review of maintenance of norms,

3. I hope that the concerned agencies in the centre and state will implement the recommendations of the committee with the commitment necessary so that the hill road infrastructure is preserved and continue to perform its due role.

4. I would like to take the opportunity to express my sincere thanks to the members of the committee for their guidance in completing the work of the committee and the other officers of this Ministry, the Indian Roads Congress and State P.W.D. for the efforts put in by them in the preparation of the report.

With regards,

Shri S.P. Bagla
Secretary,
Ministry of Surface Transport,
New Delhi - 110001

# CHAPTER-1

## INTRODUCTION

1.1. The Ministry of Surface Transport, Govt. of India had constituted, in January, 1993, a Committee on Norms for Maintenance of Roads. This committee while submitting its recommendations inter-alia observed that there was a need to work-out the maintenance requirement separately for hill roads keeping in view the peculiar problems encountered in hilly region such as landslides, removal of slips, clearance of snow in high altitude areas, maintenance of retaining/breast walls, etc. Though the Committee recommended updated premiums for hill roads on ad hoc basis, it observed that this may not meet the needs of hill roads fully and separate norms for hill areas are needed.

1.2. Accordingly, the Ministry of Surface Transport, Govt. of India constituted a Committee on Norms for Maintenance of Roads in Hill Areas vide their letter No.RW/NH-11033/2/92/DOI dated 16.3.93 (ANNEXURE-I)

1.3. **TERMS OF REFERENCES:**

The terms of reference of Committee are:

1. To review and update the exiting norms and criteria adopted for assessing the requirements of funds for maintenance of roads in hill areas.

2. To review the existing arrangements for monitoring of funds provided for maintenance and recommend measures for effective monitoring and supervision.

3. To recommend methodology and approach for updating and its periodicity for review of maintenance norms.

1.4. **COMPOSITION:**

The composition of the Committee is as under:

| | | |
|---|---|---|
| 1. | Shri D.K. Gupta<br>Engineer-in-Chief,<br>PWD, Uttar Pradesh | Chairman |
| 2. | Shri S.N. Mane,<br>Additional Director General<br>Border Roads. | Member |
| 3. | Shri S.K. Agarwal<br>Chief Engineer,<br>P.W.D. Himachal Pradesh | Member |
| 4. | Shri C.K. Hazarika<br>Secretary<br>P.W.D., Meghalaya | Member |
| 5. | Shri B. Megu<br>Chief Engineer<br>PWD Arunachal Pradesh | Member |
| 6. | Shri M. Radhakrishnan<br>Chief Engineer,<br>PWD, Kerala | Member |

| | | |
|---|---|---|
| 7. | Shri S.P. Gupta<br>Chief Engineer<br>P.W.D. JAMMU | Member |
| 8. | Shri S. Biswas,<br>Chief Controller of Accounts<br>Ministry of Surface Transport | Member |
| 9. | Shri D.P. Gupta<br>Chief Engineer (Planning)<br>Ministry of Surface Transport<br>(Roads Wing) | Member Convenor |

Shri Ravindra Kumar, Chief Engineer, Kumaon Zone, P.W.D., Almora (Uttar Pradesh) was also coopted as member of the Committee.

1.5. The first meeting of the committee was held on 26.4.93 in New Delhi when broad issues pertaining to the maintenance requirements for hill roads were discussed. Subsequently, detailed questionnaire was circulated to all members requesting them to intimate the maintenance practices being followed in their States for hill roads, the funds being allotted under different maintenance sub-heads, current average rates of labour and material, etc.

The second meeting was held at Nainital from 23rd to 25th May, 1993 when a draft report prepared by the Chairman was discussed at length. The draft report was modified and restructured based on the views expressed by the members in the meeting. The report was subsequently approved by the Committee subject to certain modifications to be carried out by the Member Convenor. The report was later on finalised by the Chairman.

S/Shri S.K. Agarwal, B. Megu and M. Radhakrishnan could not attend meetings of the committee.

1.6. These recommendations are supplement to the general recommendations made by the committee on norms of roads which are not being repeated in the report. However, these shall be valid for Hill roads also.

# CHAPTER 2

# IMPORTANCE OF MAINTENANCE

## 2.1. ROLE OF TRANSPORTATION

2.1.1. Transport is a very vital infrastructure for rapid economic growth of the country. In a developing country like India, transportation of natural resources which are not equally distributed throughout the length and breadth of the country is a basic input for economic growth. In fact the development of important sectors of economy such as agriculture, industry, mining and forestry, as well as international trade depends upon on efficient and speedy transportation network. Social activities such as education, health, family planning and promotion of tourism also depend to a large extent on transport. Accessibility is thus the first requirement for any development activity.

2.1.2. Out of the various modes of transport, road transport, is the only mode, which is complete in itself. Because of certain advantages such as flexibility, door to door service, reliability, speed, less stringent packing conditions etc., there has been a gradual shift in volume of traffic carried by roads over the past four decades and this trend is expected to continue.

2.1.3. The share of road transport in freight movement has increased from 11 per cent in 1951 to 60 per cent in 1951 to 80 per cent now.

## 2.2. GROWTH OF ROAD NETWORK IN THE PAST

2.2.1. In the last four decades, our road network has increased from 4 lakh km to 20 lakh km. Annexure-II gives an idea of the steady growth of road network in the country. Simultaneously the population of vehicles has also witnessed an unprecedented growth from 3 lakh vehicles in 1951 to about 213 lakh vehicles in 1991. Annexure-III gives historical growth of vehicle population.

2.2.2. The place of development of highways has thus been overtaken by the growth of traffic due to growing economic activities.

Inadequacies in road width and crust thickness are now threatening the economy causing congestion, delay and higher vehicle operating costs. There has also been steep increase in the number of road accidents and resulting fatalities, Annexure-IV gives the increase in road accidents during the last two decades.

## 2.3. HIGHWAY MAINTENANCE

2.3.1. An amount of nearly Rs.20,000 crore (Annexure-V) has been spent on roads during the various plan periods so far. The road network built at such a huge cost is now showing signs of disintegration and deterioration alround. For the preservation of huge public investment in highways, their timely upkeep and maintenance is an inescapable necessity. Maintenance of roads serves four main purposes:

i) Reduces rate of deterioration and prolongs life of road.
ii) Reduces Vehicle Operating Cost by providing good riding quality.
iii) Keeps road open more continuously for use of traffic particularly in monsoon season.
iv) Adds to the safety of the road user.

2.3.2. The problem of maintenance has acquired a new urgency in recent years as the traffic using the roads has shown a steep increase and this has also been accompanied by an all round rise in cost of materials and wages of labour. Highway maintenance budgets have, however, not risen correspondingly over this period. As a consequence, there has been a general fall in the maintenance standards and deterioration of surfaces in many cases.

2.3.3. The Planning Commission in their document on the Eighth Five Year Plan (1992-97) has inter-alia made the following observation in respect of road maintenance (ref. para 9.9.8 Vol.II pp.232).

"Maintenance of roads has not received adequate attention in the past primarily because of lack of funds."

It was estimated that availability of funds for maintenance generally does not exceed 60 per cent of normal requirements and in case of rural roads it is still less.

The overall gap between requirements and actual allocations has been self-accumulating over several years.

2.3.4. The failure to maintain roads is tantamount to an act of disinvestment for it implies the sacrifice of past investments in roads. Continuous neglect of maintenance may even lead to complete loss of infrastructure built at great cost. However, bad roads seldom deter users or curb the volume of traffic. Instead they raise the cost of road transport and thus the road users bear the brunt of these additional costs.

## 2.4. COMPONENTS OF MAINTENANCE

The objective of maintenance is to maintain roads and bridges on a continuing basis to their original level of construction and serviceability.

The maintenance operations are divided into following major activities:

a) **ORDINARY REPAIRS**

This activity involves routine maintenance such as maintenance of-culverts, patch repairs, road side drainage, repairing of shoulders, painting of highway signs and arboriculture. This is also referred to as routine maintenance.

In hill areas, ordinary repairs also include some major repairs like repairs to breast walls/retaining wall, removal of slips/snow clearance and repairs to drains and reconstruction of damaged works.

b) **PERIODICAL RENEWAL**

This activity involves provision of renewal coat to the wearing surface at a predetermined frequency.

This is done to safeguard the road crust and at the same time giving pavement a better riding surface.

c) **SPECIAL REPAIRS**

This activity deals with minor works of original nature such as minor improvement to curves improvements to visibility, repairs to culverts, bridges etc.

d) **RAIN/FLOOD DAMAGE REPAIRS**

This activity involves immediate repairs to roads breached during incessant heavy torrential rains/floods due to landslide and washing away of bridges.

# CHAPTER 3

# SPECIAL REQUIREMENTS OF MAINTENANCE OF HILL ROADS

## 3.1. GENERAL

The maintenance operation for in Hill roads (cross slope of terrain greater than 25 per cent) differ greatly from those for plain roads because of the typical characteristics of hill roads. This variation is due to different topographical conditions of roads in hills. The basic difference in the hill roads is its gradient, cross-slopes requisite cross drainage works and problems related to heavy rain fall and snow. The ruling gradient of roads in hills is generally 1:20 and the gradients upto 1 in 12 have also to be adopted whereas the gradients in plains normally do not exceed 1:100. The second major variation is that the roads in hill have a large number of curves for which radius upto 14 M is to be provided whereas the roads in plains do not have curves of lesser than 250 M radius. The problem of excessive wear and tear of road surface at these curves is significant. Quite often the roads in hills have to be provided with hairpin bends which have consequent problems of disposal of surface drainage and slips. The road surface at curves has to be provided with superelevation which, in case of hill road, is normally the limiting Super Elevation of 1:15. Hills normally have much higher rain falls and there are occasional cloud bursts also. The hill roads therefore require much larger cross drainage works than roads in plains. It may be recollected that the hill roads should have a proper and efficient drainage system. The road have to be constructed at high altitudes which are covered by snow for a considerable period. Such roads have to face the problems of frost and snow.

## 3.2. SPECIAL PROBLEMS IN HILL ROADS

### 3.2.1. LAND/ROCK SLIDE

Landslides constitute by far the most serious problem in maintenance of roads in hilly terrain subjected to heavy rainfall.

Denudation of hill, deforestation, cuts steeper than angle of repose, rock cutting with faults and joints in adverse dispensation, thawing effect on rock laminates due to seepage of rain water and freezing and melting into rock joints during winter, movement of over-burden over the underneath rock interfaces etc. all cause landslides and rock slides during and after rains and snow fall.

### 3.2.2. DRAINAGE

3.2.2.1. The single most important factor far Hill roads maintenance management is drainage both in respect of surface/sub-surface and cross drainage, especially in the areas which receive high and intense rain and snow-fall. The drains (Kaccha or Pucca) built to adequate sections need to be cleaned and cleared all the time, so that the catchment water from the hill-side and the road surface water from camber to drain side is efficiently drained out without causing surface over-flow or sub-surface flow. This needs regular cleaning/clearing drains of all debris which get deposited by surface erosion from hill side to ensure the flow of water through the drains rather than over the road surface.

3.2.2.2. The drain water needs to be drained out either through culverts or dips or scuppers and such structures also need to be kept clear all the time to ensure efficient cross drainage of the road surface water as well as natural run off from the hill side.

3.2.2.3. The rainfall in high altitude area is generally scanty and the drainage problems are mostly due to melting of snow/ice and thawing of ice lanses in frost penetration zone. During snow clearance operations, the road formation itself acts as a drain, because the side drains filled with compacted snow can be cleared only at the end of the operation. This causes heavy damages to the pavement and at times, even the base/sub-base also get washed off, particularly when that gets loosened due to movement of tracked snow clearance equipment and frost heave action.

It is advisable to remove the snow with the snow clearance equipment leaving 15-20 cms of snow over the road crust to obviate damage to the pavement due to movement of snow clearance equipment. The temperature rise during the day results in rapid melting of snow in catchment areas of the streams leading to high floods during the evenings. Flash floods also sometimes occur due to bursting of lakes formed due to avalanches, leading to damages to the bridges.

3.2.2.4. Quick run-off condition from the catchments created due to deforestation, intensive precipitation causing high or flash floods in Nallahs rivulets and streams also cause heavy damages to the previously constructed cross - drainage structures which also need to be inspected, monitored and repaired before and after heavy rains for uninterrupted service effectiveness of "Hill roads system".

### 3.2.3. SOIL EROSION

Erosion of soil from hill slopes both above and below the road formation eventually leads to landslides/choking of drains and natural water courses. In order to prevent soil erosion due to discharge of water through cross drainage structures, on valley side, proper channel training and erosion control works like packing/pitching of the channel and outfall points, drop walls, apron etc. are required to be properly maintained. The activity of establishing vegetation on barren slopes is also a part of regular maintenance activity in hill roads. Frequently, there is a problem of toe erosion of the hill slope which leads to subsidence of the road.

### 3.2.4. TOE CUTTING/SCOUR OF HILLS BY STREAMS

Hill toe cutting by Nallahs and streams also causes sinking and sliding of road stretches. The preventive measures for such phenomena are generally cost prohibitive and maintenance of even temporary road formation at such locations also entails heavy maintenance cost by way of positioning of heavy earth moving equipments, POL and labour etc. for ensuring communication of traffic.

### 3.2.5. MAINTENANCE OF RETAINING WALLS

Because of the financial constraint most of retaining walls constructed on Hill roads are either Kachha dry R.R. Masonary or dry R.R. Masonary with horizontal and vertical bands of R.R. Masonary in cement with lean mortars and only in far and few locations these are Pucca Stone Masonary cement walls. Most of these Retaining walls are constructed on the basis of empirical practice rather than proper structural analysis and design for considerations of short-term economy in initial cost, expediency, and commensurate cost V/s service effectiveness. In high intensity snow/rain fall hilly areas, the damages to the Retaining Walls are often collosal during and after heavy incessant torrential rains due to the following reasons requiring huge maintenance cost for restoration of the same for making the road traffic-worthy.

i) Erosion of toe of Retaining walls due to surface water over-flow over Retaining walls due to blockage of drains/land slides or some other reaons.

ii) Ingress of water into the back-fill exerting high pressure.

iii) Stability failure of high Retaining Walls Constructed as per empirical practice under worst compounded conditions.

iv) Foundation failure or settlement due to geological changes.

v) Sliding of foundation of Retaining Walls.

vi) Loss of passive resistance to the foundation soil of the Retaining Walls.

Constraint of funds either under maintenance or Capital outlays, does not permit the rehabilitation of the Retaining walls with permanent design stability and there is always a tendency to restore the same almost with the original type of design and specifications to ensure mobility of traffic as quickly as possible with the result collosal amounts are required for maintenance of Retaining walls every year on the Hill Roads.

### 3.2.6. PROTECTIVE WORKS

Regular protective works are required to be carried out in changing road system regime in areas of moving slides, scoured/eroded foundation of cross drainage structures, for protecting slide prone areas by way of constructing Breast walls/Check walls etc. and other locations according to necessity from time to time, which also necessitate substantial maintenance cost on Hill Roads.

### 3.2.7. SNOW FALL

Heavy snow fall combined with severe cold climate causes numerous problems for the maintenance of roads at high altitudes. The problems faced are slow seepage, (causing subsidence of subgrade over long lengths destabilisation

of hill slopes resulting in landslides), snow avalanches (causing damage to road formation, pavement and permanent structures), effect of frost and icing problems (causing slipperiness). Snow fall in altitudes upto 3000 metres in generally light/medium with a depth of about one metre. Clearance of such snow can be done continuously as and when it occurs and is fairly easy as compared to the compacted snow. This operation can be done from within the provision made for slide clearance in the maintenance norms. However, in higher reaches, where the intensity and periodicity of snow fall is high and is combined with avalanches and icing problems, it is not possible/economical to undertake snow clearance operations continuously. In such cases, snow is allowed to accumulate during winter months and cleared at the end of the winter. This operation needs special efforts as the depth of compacted snow on the road at places is of the order of 10 m to 20 m, or even upto 30 m at avalanche sites and passes. Special snow clearance grant based on the assessment of resources like dozers, motor graders, snow ploughs, rotary snow blasts, snow sweepers etc. has to be made for such heavy snow clearance.

### 3.2.8. PAVEMENT

The damages to the pavement occur due to movement of tracked snow clearance equipment, flow of water over the pavement and uneveness/cracking due to frost heave during freezing and subsidence during thawing. Considerable efforts are required to repair such damages. Chemicals/abrasives are used at times to reduce slippery conditions due to icing.

### 3.2.9. RESTRICTED EFFICIENCY OF MEN AND MACHINES

Efficiency of men and machinery decreases at high altitudes due to lack of oxygen, low atmosphere pressure and severe climatic condition. Working hours are also restricted. Working season for construction works involving cement and bitumen is normally limited between middle of May to middle of November.

### 3.2.10. LACK OF RESOURCES

The high altitude regions are well known for lack of resources. In certain regions even stone for construction has to be imported from long distance. The shortage of water is almost chronic because of existance of very few water courses. The availability of fuel like timber is almost negligible.

## 3.3. MAINTENANCE OF SEMI PERMANENT BRIDGES

In hilly areas, the number of streams and nallahs are quite large, for which a number of major and minor bridges are required. These bridges require frequent maintenance of protective works as these are often damaged due to high velocity flow of water along with debris. These timber bridges having limited life cycle need replacement with respect to their deck, flooring, supporting trusses and beams, railings etc. periodically. Till such time, these are replaced by permanent bridges, these have to be maintained.

## 3.4. AFFORESTATION ALONG ROAD SIDES

Afforestation along road sides on hill slopes is essential for the stability or road structure.

The maintenance of such plantation is a charge on the maintenance norms of the hill roads.

## 3.5. SALIENT MAINTENANCE ITEMS

The salient maintenance items for hill roads are as under:

i) Repair of cross drainage works such as scuppers, causeways, dips and culverts.

ii) Cleaning of side drains, catch pits, scruppers, repair and construction of toe/breast walls, retaining walls, crib walls and boulder crates etc. due to erosion/subsidence, hill side drains and catch water drains, etc.

iii) Repair of parapets and edge stones

iv) White washing of parapets and hill side traffic visuals to guide the traffic during night and in fog.

v) Removal of slips and snow in High Altitude Areas.

# CHAPTER 4

# CRITERIA ADOPTED AND NORMS PROPOSED

## 4.1. EXISTING NORMS

The existing norms as recommended by the committee set up in 1988 provide for a premium of 15 per cent over the maintenance norms for roads in plain areas for hills having no snow fall and 30 per cent for roads having snow fall. These norms have been updated in March, 1993 by a Committee constituted by the Govt. of India, which provisionally recommended a premium of 25 per cent over normal maintenance cost (for ordinary repairs only) in plains for roads having no snow fall and a premium of 40 per cent for roads having snow fall and further suggested that in view of specific features of hill roads, separate norms need to be avolved.

## 4.2. APPROACH FOR FIXING NORMS

### 4.2.1. ZONING

The cost for maintenance and repairs of roads includes cost of stone chips/metal, sand, cement, bitumen and labour input. The cost of materials goes on increasing with the altitude. Keeping this in view the maintenance requirements have been worked-out by dividing the hill roads in three categories as under:

i) Category I - Upto 500 M. altitude i.e. foot hill

ii) Category II- From 500 to 2000 M. altitude Middle hill range

iii) Cateogy III- 2000 M. altitude - High altitude hills

### 4.2.2. CATEGORIES OF ROADS

The maintenance norms have been evolved for two categories of road viz. State Highway/Major District Road (MDR) and other District Road (ODR)/Village Road (V.R.). Further with respect to surfacing, maintenance norms have been worked out for black topped, WBM Kaccha and bridle roads.

### 4.2.3. TRAFFIC CLASSIFICATION

For the purpose of norms, the SH/MDR have been divided into two traffic zones namely less than 450 commercial vehicles per day (CVD) and more than 450 per day (CVD). For the O.D.R./V.R. only traffic upto 450 CVD has been considered.

## 4.3. ROAD GANGS

4.3.1. The road gangs employed by P.W.Ds attend to routine maintenance to keep the road pavement and shoulders in proper shape and condition and free from undergrowth and other obstruction. These gangs also attend to defects like pot holes. edge breaking, cracking of surface, etc. by carrying out patch repair work.

4.3.2. The existing road gang system prevalent in various State was reviewed. The considered view of the Committee is that this system is outmoded and inefficient. In many States the existing road gang staff is in excess of the norms of 0.3 labour/Km. In some States, the existing staff is almost double compared to the norms. No fresh recruitment, however, is generally being made for road gangs in most States. As almost all the States are paying wages to the road gangs as per the Minimum Wages Act or even higher wages, bulk of the maintenance funds are going towards meeting the wages and very little funds are left for actual maintenance of the road. It is also felt that all the States should bring down the road gang strength to a maximum of 0.3 labour per Km. by 1995-96. The States, should therefore, make concerted efforts in this regard so that more funds become available for preventive maintenance of the road.

4.3.3. The feasibility of introducing mechanisation in the routine maintenance work was also considered. It is felt that only part mechanisation may be possible since some of the items like berm repair, patch repair etc. can be done only manually.

Therefore, some element of minimum labour is a must for road maintenance operations.

4.3.4. It is the general experience that the output of the casual labour is higher compared to permanent road gangs. The Committee, therefore, recommends that efforts should be made to keep the permanent labour to the minimum i.e. only for carrying out patch repairs, clearing of road surface and dressing of berms and other maintenance operations should be got done through casual labour.

4.3.5. The Committee wishes to stress that to overcome the difficulties of maintenance operation, a change in the present methods of road maintenance being done solely through gang labour is called for. It is time a shift was made to the system prevalent in other advanced countries where instead of moving individually on foot, the labours move about collectively in groups of 8 to 10 with patcher mounted on trolley or in a truck equipped with the necessary tools for routine mantenance. Such groups because of their mobility, are capable of looking after sections of road from 30 to 50 Km. with much greater ease and efficiency than dispersed gang labourers as now.

4.3.6. It was brought out that mobile system of road gangs has been tried on National Highways in the States of Rajasthan and U.P. and on State Highways in Haryana etc. Experience has shown that the system is efficient although more costly initially. It is likely that similar system with minor adjustments for the peculiar conditions of hills would prove cost effective in the long run. Broad requirements of labour force, tools and plants and material for a Mobile Maintenance Unit are given in ANNEXURE-IV. It is recommended that the system of mobile road gangs may be introduced in more States on experimental basis and decisions taken for reorganisation of the maintenance operations for improved efficiency on the basis of experience gained out of these experiements.

## 4.4. PATCH REPAIRS

For the purpose of carrying out patch repairs, on BT roads the patch area has been considered as 5.5 and 6 per cent for the two traffic classification of less than 450 CVD and greater than 450 CVD respectively for State Highways/MDRs. The patch area for WBM roads in these categories has been considered as 5.5 per cent. Average thickness of patch has been taken as 25 mm for B.T. roads and 75 mm for WBM roads.

## 4.5. FIXED COST ITEMS

There are certain maintenance activities under ordinary repairs for which lump sum provisions based on experience/analysis are proposed. The activities are:

i) Repair to breast walls/retaining walls, bed bars, etc.

ii) Removal of slips/snow clearance

iii) Repair to drains and reconstruction of damaged works.

iv) Repairs to parapet walls/jungle clearance wherever needed

v) C.D. works and bridges, clearing of scuppers, reconstruction of toe wall and protection walls.

vi) Store House and Sheds

vii) Arboriculture

viii) Traffic Census

Provisions for above mentioned items are indicated in ANNEXURE-VII A to F with relevant rate analysis in ANNEXURE VIII to XII.

## 4.6. PREMIUM FOR RAINFALL

The major problems faced in maintaining the hill roads are landslips, drainage and soil erosion as a result of rainfall.

Heavy rainfall results in extensive damages to breast walls/retaining walls, drains and soil/rock slides, which have to be attended to on priority from routine maintenance funds .

The analysis prepared are for hill roads having rainfall between 1500 to 3000 mm per year. Provisions for the items relating to major repairs (repairs to breast walls/retaining walls, removal of slips, snow clearance and repairs to drains and reconstruction of damaged works) under ordinary repairs may be reduced by 15 per cent in case of hill roads having rainfall less than 1500 mm per year and the provision increased by 15 per cent in case of hill roads having rainfall more than 3000 mm per year.

## 4.7. SPECIAL NEEDS OF HILL ROADS SUBJECTED TO HEAVY SNOWFALL

As earlier mentioned, heavy snowfall combined with cold climate causes numerous problems for the maintenance of roads. The main task in such areas is to clear the snow and restore the road to traffic. It is proposed that snow clearance work for snow fall upto 1 m in a year can be done from out of the provision recommended for removal of slips/snow clearance. For snow fall more than this, the repair needs may be separately assessed on case to case basis and approval of competent authority obtained for special repairs to restore the road to traffic.

## 4.8. PERIODIC RENEWALS

The life cycle for different renewal treatments depends on several factors climate, soil and traffic conditions. Table gives the recommended renewal cycle in year and treatment for different categories of roads.

**LIFE CYCLE IN YEARS FOR DIFFERENT RENEWAL TREATMENT**

| Type of Treatment | S.H/M.D.R. | | | | O.D.R/V.R. | |
|---|---|---|---|---|---|---|
| | Traffic upto 450 CVD | | Traffic more than 450 CVD | | Traffic 450 CVD | |
| | B.T. | WBM | B.T. | WBM | B.T. | WBM |
| S.D.C. | - | - | 6 | - | - | - |
| P.C. | 6 | - | 5 | - | 6 | - |
| S.D. | 5 | - | 4 | - | 5 | - |
| MR | - | 5 | - | 4 | - | 5 |

SDC - 25 mm semidense carpet
PC - 20 mm premix carpet with seal coat
SD - One coat surface dressing with precoated chips
MR - 75 mm (compacted) mental renewal i.e. 100 mm loose

## 4.9. SPECIAL REPAIRS

There are certain items of work of original nature such as minor improvement to curves, improvement to visibility repair/reconstruction of protective works etc. which may be required to be done. A lump-sum provision of Rs.2000/- per lane per Km is proposed for such works.

## 4.10. RAIN/FLOOD DAMAGE REPAIRS

Heavy rains/flash floods in hilly areas often result in washing away of bridges, slides/in the hill face resulting breach of road works etc. It may not be possible to restore these damages from out of funds for routine maitenance. A lump-sum provision of 12.5 per cent of O.R. and P.R.costs is proposed for such repairs.

## 4.11. SEMI-PERMANENT TIMBER BRIDGES

4.11.1. In the North-East region and a few pockets of certain States, there are a number of semi-permanent timber (SPT) bridges which are yet to be replaced by permanent RCC bridges. For instance there are about 1,48,400 running meters of SPT bridges in Assam alone.

Due to socio-economic growth in the region, some industries have already come-up, with the result there will be more generation of vehicular traffic. And hence, these timber bridges will have to be replaced by permanent bridges gradually as per availability of plan funds. In the meantime, the existing SPT bridges need to be maintained properly to keep the roads in traffic worthy condition.

4.11.2. In the maintenance norms now being proposed there is a lump sum provision for the maintenance of bridges which is not considered to be adequate to cover the maintenance of SPT bridges also. Hence rate analysis for Assam has been given to indicate the unit cost of maintenance of SPT bridges/Km length of road. The cost thus worked-out is about Rs.9000/- per Km. (Annexure-XIII). Similarly, the unit cost of maintenance can be worked for other regions where such type of bridges still exist.

## 4.12. BRIDLE ROADS

Bridle roads are additional category of roads in hill areas. These serve villages and habitations in the remote, under developed and under development areas at varying altitudes. Bridle roads are not motorable roads and have steeper gradients for connecting villages and places and are used for pedestrians and animals transport. During rains these are heavily damaged in the form of slips, erosion, etc. and have to be maintained for use of movement on foot. A provision of Rs.5000/- per Km is proposed for maintenance of such roads (Annexure-VII D to F). The rate for maintenance shall be on the basis of actual requirements in case of roads which require snow clearance of more than 1 m.

## 4.13. FOOT BRIDGES

In addition to permanent and SPT bridges on hill roads, a number of foot bridges are also constructed across the streams in remote area even without any hill roads. These are also required to be maintained and a separate provision for @ 1000/- per metre shall be needed.

## 4.14. MAINTENANCE REQUIREMENT FOR TWO LANE/INTERMEDIATE LANE ROADS

The requirement of funds for various items of works has been worked out for single lane of road per Km. Requirement of M&R grants for two lane road would be 60 per cent more than on one lane road. Like-wise for intermediate roads (5.5m) the M&R grants would be 30 per cent more than on one lane road.

## 4.15. RECOMMENDED NORMS FOR MAINTENANCE AND REPAIRS

4.15.1. The Committee after discussions and careful consideration of

a) factors relevant to maintenance and repairs requirement
b) review of M&R practices in the States
c) the study of the earlier work done by similar Committees, study Groups
d) the present day needs of rapidly growing traffic
e) life cycle costs

has worked out norms for different categories of roads carrying different traffic volumes and located in different price zones. These norms are minimum "Must" if the large capital assets are to be saved from deterioration beyond redemption. The details of norms of M&R costs for roads are given in ANNEXURE-VII A to F respectively for State Highways and other roads with the supporting rate analysis in ANNEXURE-VIII to XII.

4.15.2. The gist of M&R costs for lower and higher need roads in the zones is given in table below:

**M&R COSTS PER KM IN LAKHS SAVING ANNUAL RAINFALL BETWEEN 1500-3000 MM**

| Category | Surface | Foot Hill I | | Medium Altitude Hill II | | High Altitude Hill III | |
|---|---|---|---|---|---|---|---|
| | | Less than 450 CVD | More than 450 CVD | Less than 450 CVD | More than 450 CVD | Less than 450 CVD | More than 450 CVD |
| SH/MDR | BT | 61000 | 67000 | 69000 | 76500 | 76500 | 85500 |
| | WBM | 43000 | 47000 | 56000 | 62500 | 56000 | 62500 |
| ODR/VR | BT | 54000 | — | 62000 | — | 69500 | — |
| | WBM | 37000 | — | 49000 | — | 49000 | — |
| | Kacha | 22500 | — | 27500 | — | 27500 | — |
| | Bridle road | 5000 | — | 5000 | — | 5000 | — |

4.15.3. The State PWDs and other executing agencies for road would need to work out the requirement of funds for maintenance separately under the four sub-heads viz. Ordinary Repairs, Periodic renewals, Special Repairs and restoration of flood/rainfall damages. The figures given in Table above include element of special repair and flood/excessive rain damages repair on pro-rata basis.

## 4.16. PERIODICITY/PROCEDURES FOR UPDATING THE NORMS

The norms need to be updated periodically to account for the change in traffic pattern technological advancement and experience etc. After deliberation on various aspects in the meetings of the Committee, it is recommended that the norms be reviewed after an intervel of 5 years. This may coincide with the formulation of Five Years Plans. The norms should in any case be updated every year to allow for the increase in prices of material and wages of labour etc. This should also be applied to fixed cost items mentioned above when found necessary.

# CHAPTER 5

# REVIEW OF EXISTING ARRANGEMENTS FOR MONITORING

## 5.1. EXISTING SCENARIO

5.1.1. The budgets for road maintenance are often much less compared to the requirements as per norms. Because much of the budget goes towards the wages of large labour force, the balance available funds for maintenance of road proper get further reduced when budgets are cut or prices rise. Hence there is a dire need for improving the efficiency of the organisation and it must focus on ways to make the organisation accountable for their performance.

5.1.2. The absence of the internal accountability is a common cause of the institutional failure of the road authority. The allocation of funds is seldom linked to explicit physical plans and post project evaluation is rarely done. In order to ensure the desired progress in terms of physical and financial targets, it is essential to keep a close watch by monitoring of funds provided for maintenance. To achieve the above, the existing arrangements for monitoring of funds need to be reviewed and made more stringent.

## 5.2. MEASURES FOR MONITORING THE PROGRESS OF MAINTENANCE

5.2.1. The staff involved in the maintenance should be dedicated and fully motivated. Training of all personnel involved in maintenance is an integral part of the maintenance function. To achieve better performance, the training of the operating and maintenance personnel (gang men/mate Engineering subordinates/junior engineers) is necessary.

5.2.2. As per the existing system, the routine maintenance/ordinary repairs is being done departmentally by most of the State PWDs. In the above system, there are some problems, like the management of labour force and material and tools. Experience shows that for one reason or the other it is very difficult to enforce discipline among the labour force by the departmental staff and, therefore, full utilisation of labour is not achieved. Further, at time it also becomes difficult to maintain regular supply of material required for maintenance particularly at critical juncture i.e. during monsoon which hinders the maintenance operation. To obviate above problems, it is suggested that as an experiment the work of routine maintenance/ordinary repairs may also be tried to be got done through contracting agency, on the heavily trafficked sections. This system will have following advantages:

- The problem of managing the labour force and continuous supply of material by the department will be removed.
- It will be the responsibility of the contractors to maintain the road in a traffic worthy condition round the year.
- Close supervision and evaluation of work can be done by a separate agency other than executing agency itself. This will also improve accountability.

5.2.3. A system for collecting the data needed to monitor performance (financial flows and physical performance) is also equally necessary. The data can also be used to make an independent and public assessment of the agency performance. Some kind of audit of expenditure on maintenance is required.

5.2.4. Planning and scheduling operations should be given due importance. Budgeting for maintenance expenditure should also be done in advance to facilitate field officers to plan and implement the programme effectively. It is necessary to carry out pre/post monsoon inspections for condition survey and to assess the quantum of maintenance tasks.

5.2.5. Attention of the State PWDs is also required for monitoring of implementation and intervening to rectify the lapses revealed during monitoring, meaningful supervision, surprise checks, management of tools and equipment used for maintenance, disaster management measures from cyclones, unprecedented floods or other natural calamities, balanced allocation of available funds among the different maintenance activities.

5.2.6. Maintenance culture needs to be improved in respect of roads. Each State should bring out a booklet giving the names of roads or sections of road that are programmed to be treated with surface renewal every year together with a subsequent appraisal of actual achievements and reasons for shortfall, if any. Similarly, bridges programmed to be maintenaned should be indicated.

## 5.3. DOCUMENTATION AND RETURNS

5.3.1. Indian Roads Congress has brought out a number of publications on various aspects of maintenance operations, which contain detailed instructions on execution and monitoring of the maintenance operations. These are :

1. Ministry of Shipping and Transport (Roads Wing) Manual for Maintenance of Roads
2. IRC:82-1982 "Code of Practice for Maintenance of Bituminous Surface of Highways"
3. IRC:SP:18-1978 "Manual for Highway Bridge Maintenance Inspection"
4. IRC:SP:35-1990 "Guidelines for Inspection and Maintenance of Bridges"

The State PWDs and other executing agencies should follow the guidelines given in these publications for carrying out and monitoring of the maintenance operations.

5.3.2. Effective monitoring can be done through submission of returns, details for which are given in the IRC Manual for Maintenance of Roads. The important returns for monitoring at different levels in the field are suggested below :

i) At the lowest of Junior Engineer, a report of work accomplished during the week should be filled in the form of Work Report (Annexure-XIV)

ii) Assistant Engineer in-charge of Sub-Division should call a meeting of Junior Engineers under his control once a month and review both the physical and financial progress made during the month and a consolidated report sent to the Executive Engineer in-charge of a Division.

iii) The Divisional Engineer should convene a meeting of Assistant Engineers under his charge once a month and review the progress of work both physical as well as financial. He should submit the report to the Superintending Engineer in the format suggested at Annexure-XV.

iv) Superintending Engineer/Chief Engineer should review with Executive Engineer atleast once in three months for effective control on maintenance.

However, for effective monitoring, these returns should not be treated as routine formality. These need to be critically examined and analysed in the correct perspective at different levels. For effective supervision actual material consumption, labour output etc. need to be examined thoroughly and remedial measures taken where called for.

## 5.4. MONITORING

### 5.4.1. AT CENTRAL LEVEL

The States are by and large not getting the allotments as per the norms and recommendations of the Finance Commission. Many of the States are just getting only about 50 to 70 per cent of the recommended amounts. In this context, the following extracts from the Report of the Ninth Finance Commission are reproduced :

> "We find that successive Finance Commissions have made provision for maintenance expenditure based on certain engineering norms, but the expenditure incurred in actual practice by the State has been for too low relative to the norms as well as the requirements for the maintenance of the assets even on a minimum basis. There appears to be a strong preference for the creation of additional assets with little attention being paid to the maintenance of assets already created. In the process, the quality of the assets and their useful life span decline steeply. The neglect of maintenance is an unhealthy practice and must be discouraged. The amount required to the maintenance of the existing assets should be the first charge on the resources of the States. We would even suggest that the Planning Commission should be given a special responsibility for ensuring that the maintenance of the existing assets in the States is in no way compromised. At the time of assessing the resources for the State Plan, the Planning Commission should take special care to ensure that the maintenance expenditures are fully provided for".

Therefore, the Committee cannot but underline the need for having a mechanism for monitoring of release of funds by State for Maintenance and Repairs and also to know broadly how the funds are allocated. The Committee recommends that monitoring and evaluation may be done by a Central Agency which could be the Ministry of Surface Transport (Roads Wing) and the Planning Commission.

### 5.4.2. AT STATE P.W.D. HEADQUARTER

5.4.2.1. In order to ensure optimum utilisation of maintenance funds, allotment of funds to field officers should be appropriated distinctly under the sub-heads, O.R.P.R., S.R. and F.D.R. as is being done by the Ministry of Surface Transport (Roads Wing), in respect of National Highways. The targets may be set both in physical and financial terms. The expenditure actually incurred on maintenance may be booked distinctly under the above mentioned heads to enable monitoring and control at various levels of the department.

## 5.5. QUALITY CONTROL AND QUALITY ASSURANCE

### 5.5.1. QUALITY CONTROL

To ensure proper quality control in the execution of maintenance works, it is felt by the Committee that a quality Monitoring Cell may be constituted under Engineer-in-Chief/Chief Engineer which shall undertake random checking. With the above provision, there should not be the need for any other independent agency to be involved in checking the quality of maintenance works.

### 5.5.2. QUALITY ASSURANCE

5.5.2.1. It was felt by the Committee that there should be some in built system for quality assurance. It was observed that the officer who is responsible for the progress of work should also be accountable for quality of works instead of entrusting the job to some other officer/agency who are not accountable for the progress of work. In view of above, it is suggested by the Committee that the Executive Engineer concerned with the execution of maintenance works would also be accountable for quality control/assurance and quality check/monitoring should be done at the level of Superintending Engineer/Controlling Officer.

5.5.2.2. It is desirable to complete all bituminous works on hill roads by the end of June every year because the work done later than this gets deteriorated during winters as the bitumen does not get enough time to mature. During rains the road surface and chips do not get dried up with the result that bitumen does not get properly coated on the chips.

5.5.2.3. The periodical renewal programme should be chalked out in advance and completed before the onset of monsoon so that the occurance of pot holes is minimised during rainy season.

# CHAPTER-6

## CONCLUSIONS AND RECOMMENDATIONS

6.1 The maintenance and repair costs per km length of road as worked out in Annexure-VII A to F reflect the Minimum needs at a price level of 1992-93. These would need to be updated every year taking into consideration prevalent rates of labour and material. In case allotments are less than this minimum, this may lead to deterioration of assets constructed at huge cost to the country. Continuous neglect of maintenance would result in much higher plan funds for rehabilitation and strengthening of existing roads and/or high operation cost of transport.

6.2 As mentioned earlier in para 1.6, general recommendations made by the Committee on Norms for Maintenance of Roads are equally applicable for hill roads. These are given in Appendix-I and may be deemed to be recommendations of this Committee also.

6.3 The Committee feels that the output of the casual labour is higher compared to permanent road gangs. Efforts should therefore be made to keep the permanent labour to the minimum i.e. only for carrying out patch repairs, clearing of road surface and dressing of berms and other maintenance operations should be got done through casual labour.

6.4 Periodic renewals of BT surfacing should preferably be done with either semi-dense carpet or premix carpet with seal coat for SH/MDFs. Renewal by single coat surface dressing may be considered as an option when adequate funds are not available and large lengths are required to be covered by thin dust-proof course. Periodic renewal of BT surface of ODR/village roads may be done with 20mm premix carpet with seal coat or single coat surface dressing as considered appropriate based on importance of road, traffic volume and availability of funds.

6.5 All repair works including pot hole filling, patching and surfacing in short stretches required on bituminous surfacings during wet season must invariably be carried out using bitumen emulsions. Use of this strategy is also advocated for 20mm premix carpet renewal coat or seal coat work carried out in the immediate premonsoon session.

6.6 In order to ensure optimum utilisation of maintenance funds, allotment of funds to field officers should be appropriated distinctly under the sub-heads, O.R., P.R., S.R. and F.D.R. The targets may be set both in physical and financial terms. The expenditure actually incurred on maintenance may be booked distinctly under the above mentioned heads to enable monitoring and control at various levels of the department.

6.7 To ensure quality control in maintenance works, a Quality Monitoring Cell may be constituted under Engineer-in- Chief/Chief Engineer which shall undertake random checking of the work done specially renewals.

6.8 There should be in built system for quality assurance. Executive Engineer concerned with the execution of maintenance works should also be accountable for quality control/assurance. Quality check/monitoring should be done at the level of Superintending Engineer/Controlling Officer.

6.9 All bituminous work should be completed in fair weather and work during monsoons and extreme cold weather should be avoided.

6.10 The periodical renewal programme should be chalked out in advance and completed before the onset of monsoon, so that occurrence of pot holes is minimised during rainy season.

6.11 In order to ensure quality, the semi-dense carpet/premix carpet should be carried out using hot mix plant etc.

6.12 For roads in high altitude areas with snow fall heavier than 1 meter additional snow clearance grant based on actual assessment should be allotted.

6.13 Although repairs to the damages in existing walls or cross drainage structures due to heavy rainfall/floods shall be carried out within the provisions of major repairs under maintenance, separate provision is necessary and is being made on ad hoc basis under the sub-head of flood damages for reconstruction of washed away bridges or sections of roads entirely damaged. This may have to be provided on basis of detailed estimates in some cases.

# CHAPTER-7

## ACKNOWLEDEMENT

The Committee would like to keep on record the valuable assistance given by Shri N.S. Jain, Superintending Engineer (Roads) Planning and Shri Sanjay Mishra, Assistant Executive Engineer (Roads) of Ministry of Surface Transport, Shri Nirmal Jit Singh, Deputy Secretary (R) of Indian Roads Congress, Shri P.K. Sharma, Chief Engineer, Pauri (Garhwal) and Shri P.C. Shrivastava, Executive Engineer, Ranikhet of U.P., P.W.D. Shri T.D. Pant of Nainital Division of U.P. P.W.D. and Shri S.K. Chadha of Indian Roads Congress provided excellent stenographic assistance.

sd/-
(D.K. Gupta)
Chairman

sd/-
S.N. Mane
Member

sd/-
C.K. Hazarika
Member

sd/-
S.P. Gupta
Member

sd/-
S. Biswas
Member

sd/-
Ravindra Kumar
Member (Co-opted)

sd/-
D.P. Gupta
Member-Convenor

ANNEXURE-I

# MINISTRY OF SURFACE TRANSPORT
## (ROADS WING)
## ORDER

*No.RW/NH-11038/2/92-DO I* *Dated 16th March, 1993*

Subject: Constitution of Committee on Norms for Maintenance of Roads in Hill Areas

The undersigned is directed to say that it has been decided to work out separate norms for maintenance of roads in hill areas. The composition of the Committee will be as follows :

| | | |
|---|---|---|
| 1. | Shri D.K. Gupta<br>Engineer-in-Chief,<br>PWD, Uttar Pradesh | Chairman |
| 2. | Shri S.N. Mane<br>Additional Director General<br>Border Roads | Member |
| 3. | Shri S.K. Agarwal<br>Chief Engineer<br>PWD, Himachal Pradesh | Member |
| 4. | Shri C.K. Hazarika<br>Secretary,<br>PWD, Meghalaya | Member |
| 5. | Shri B. Megu<br>Chief Engineer,<br>PWD, Arunachal Pradesh | Member |
| 6. | Shri M. Radhakrishnan<br>Chief Engineer,<br>PWD, Kerala | Member |
| 7. | Shri S.P. Gupta<br>Chief Engineer,<br>PWD, Jammu | Member |
| 8. | Shri S. Biswas<br>Chief Controller of Accounts,<br>Ministry of Surface Transort | Member |
| 9. | Shri D.P. Gupta<br>Chief Engineer (Planning),<br>Ministry of Surface Transport<br>(Roads Wing) | Member-Convenor |

The Terms of Reference of the Committee will be as follows :

i) To review and update the existing norms and criteria adopted for assessing the requirements of funds for maintenance of roads in hill areas.

ii) To review the existing arrangements for monitoring of funds provided for maintenance and recommend measures for effective monitoring and supervision.

iii) To recommend methodology and approach for updating and its periodicity for review of maintenance norms.

The Chairman of the Commitee may invite or co-opt such officials as may be considered necessary.

The TA/DA of the Chairman and members will be met by the respective State Governments/Departments.

The Committee will submit its report to the Ministry of Surface Transport by 17th May, 1993.

**ANNEXURE-II**

## GROWTH OF ROAD NETWORK

(Lakh Km)

| Year | National Highways | State Highways | Other Roads over 1950-51 | Total | Per cent increase |
|---|---|---|---|---|---|
| 1950-51 | 0.22 | 0.43 | 3.35 | 4.00 | |
| 1960-61 | 0.24 | 0.62 | 4.39 | 5.25 | 31 |
| 1970-71 | 0.24 | 0.80 | 8.13 | 9.17 | 129 |
| 1980-81 | 0.29 | 0.95 | 13.80 | 15.04 | 276 |
| 1990-91 | 0.34 | 1.27 | 19.06 | 20.37 | 409 |

**ANNEXURE-III**

## GROWTH OF MOTOR VEHICLES IN INDIA

(In Lakh)

| Year | All vehicles | Two-wheelers | Cars, Jeeps & Taxis | Buses | Trucks | Others |
|---|---|---|---|---|---|---|
| 1951 | 3.06 | 0.27 | 1.59 | 0.34 | 0.82 | 0.04 |
| 1961 | 6.65 | 0.88 | 3.10 | 0.57 | 1.68 | 0.42 |
| 1971 | 18.65 | 5.76 | 6.82 | 0.94 | 3.43 | 1.70 |
| 1981 | 51.73 | 25.28 | 11.17 | 1.54 | 5.27 | 8.47 |
| 1991(P) | 213.10 | 140.47 | 30.13 | 3.33 | 14.11 | 25.06 |

Note : P-Provisional

**ANNEXURE-IV**

# ROAD ACCIDENTS IN INDIA

| Year | No. of registered Motor Vehicles (in thousands) | No. of Accidents (in thousands) | No. of Accidents per 1000 vehicles | No. of persons killed | No. of persons injured (in thousands) | Total (5+6) |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1970 | 1401 | 114.1 | 81.37 | 14.5 | 70.1 | 84.6 |
| 1971 | 1865 | 120.2 | 64.34 | 15.0 | 70.7 | 85.7 |
| 1972 | 2045 | 122.3 | 59.66 | 16.1 | 76.4 | 92.5 |
| 1973 | 2109 | 121.6 | 57.85 | 17.6 | 79.3 | 96.9 |
| 1974 | 2327 | 114.3 | 48.99 | 17.3 | 76.7 | 94.0 |
| 1975 | 2472 | 116.8 | 47.33 | 16.9 | 77.0 | 93.9 |
| 1976 | 2700 | 124.7 | 46.30 | 17.8 | 82.5 | 100.3 |
| 1977 | 3260 | 135.4 | 41.41 | 20.1 | 95.6 | 115.7 |
| 1978 | 3614 | 146.3 | 40.40 | 21.8 | 99.5 | 121.3 |
| 1979 | 4059 | 144.4 | 35.48 | 22.6 | 102.9 | 125.5 |
| 1980 | 4514 | 153.2 | 33.89 | 24.6 | 109.1 | 133.7 |
| 1981 | 5173 | 161.2 | 31.12 | 28.4 | 114.0 | 142.4 |
| 1982 | 5844 | 166.2 | 28.40 | 30.7 | 126.0 | 156.7 |
| 1983 | 6905 | 177.0 | 25.63 | 32.8 | 134.1 | 166.9 |
| 1984 | 7783 | 195.0 | 25.05 | 35.1 | 156.2 | 191.3 |
| 1985 | 9097 | 207.0 | 22.75 | 39.2 | 163.4 | 202.6 |
| 1986 | 10490 | 215.5 | 20.54 | 40.0 | 176.4 | 216.5 |
| 1987 | 12539 | 234.0 | 18.66 | 44.4 | 189.0 | 234.2 |
| 1988 | 14733 | 246.7 | 16.74 | 46.6 | 214.8 | 262.0 |
| 1989 | 15920 | 270.0 | 15.96 | 50.7 | 229.7 | 279.4 |
| 1990 | 19177 | 282.6 | 14.76 | 54.1 | 244.1 | 298.2 |
| 1991 | 21310 | 294.0 | 13.80 | 56.5 | 255.3 | 311.8 |
| 1992(E) | 23000 | 308.0 | 13.39 | 57.0 | 260.0 | 317.0 |

E = Estimated

ANNEXURE-V

## PLAN-WISE DEVELOPMENT OF ROADS - EXPENDITURE

(Rs. Crore)

| | First Plan 1951-56 | Second Plan 1956-61 | Third Plan 1961-66 | Inter Plan 1966-69 | Fourth Plan 1969-74 | Fifth Plan 1974-78 | Inter Plan 1978-80 | Sixth Plan 1980-85 | Seventh Plan 1985-90 |
|---|---|---|---|---|---|---|---|---|---|
| **STATES** | | | | | | | | | |
| Andhra Pradesh | 4.23 | 11.77 | 25.02 | 11.19 | 32.59 | 52.64 | 31.10 | 168.26 | 313.56 |
| Assam | 3.74 | 13.72 | 30.38 | 21.71 | 34.49 | 56.53 | 39.75 | 177.49 | 287.82 |
| Bihar | 14.15 | 20.53 | 50.26 | 19.51 | 55.51 | 130.91 | 67.39 | 391.69 | 576.13 |
| Gujarat | 14.66 | 27.83 | 28.65 | 29.25 | 41.99 | 110.27 | 62.57 | 305.91 | 360.64 |
| Haryana | - | - | - | 6.22 | 52.83 | 37.92 | 29.43 | 101.72 | 159.95 |
| Himachal Pradesh | 2.99 | 8.36 | 11.05 | 12.58 | 33.49 | 55.39 | 36.33 | 130.40 | 166.27 |
| Jammu & Kashmir | 3.13 | 13.89 | 11.67 | 10.83 | 23.96 | 40.29 | 28.00 | 102.70 | 108.39 |
| Karnataka | 5.53 | 12.56 | 29.73 | 7.37 | 36.08 | 52.84 | 32.56 | 184.17 | 264.35 |
| Kerala | 3.40 | 8.07 | 14.66 | 12.13 | 26.66 | 42.61 | 26.29 | 125.95 | 211.10 |
| Madhya Pradesh | 7.25 | 13.06 | 18.86 | 32.44 | 47.50 | 81.05 | 48.10 | 245.66 | 486.13 |
| Maharashtra | 20.26 | 18.58 | 39.51 | 2.92 | 82.33 | 166.69 | 108.58 | 369.27 | 477.43 |
| Manipur | 0.55 | 2.03 | 4.90 | - | 11.67 | 25.22 | 12.44 | 58.03 | 122.41 |
| Meghalaya | - | - | - | - | 14.67 | 25.61 | 13.03 | 74.16 | 126.63 |
| Nagaland | - | 1.84 | 3.86 | 5.22 | 11.68 | 33.80 | 19.69 | 76.66 | 129.69 |
| Orissa | 4.20 | 8.75 | 38.65 | 16.25 | 23.79 | 42.95 | 27.99 | 114.17 | 223.52 |
| Punjab | 7.04 | 15.91 | 20.11 | 9.57 | 65.39 | 74.09 | 44.15 | 109.45 | 165.89 |
| Rajasthan | 5.98 | 12.68 | 14.45 | 25.15 | 22.32 | 79.84 | 47.25 | 281.00 | 212.96 |
| Sikkim | 0.13 | - | 0.16 | - | - | 9.70 | 8.02 | 30.18 | 39.84 |
| Tamil Nadu | 5.09 | 10.04 | 15.41 | 9.08 | 43.21 | 97.18 | 51.83 | 227.58 | 307.48 |
| Tripura | 0.73 | 3.80 | 4.50 | 3.18 | 6.39 | 17.82 | 14.52 | 54.98 | 90.41 |
| Uttar Pradesh | 7.78 | 24.10 | 37.70 | 24.56 | 102.73 | 241.93 | 174.20 | 840.23 | 1399.06 |
| West Bengal | 16.96 | 20.49 | 23.92 | 18.86 | 25.99 | 53.41 | 30.25 | 141.36 | 237.27 |
| TOTAL 'A' | 127.80 | 248.01 | 423.45 | 292.87 | 795.27 | 1528.69 | 953.47 | 4311.02 | 6466.93 |
| **UNION TERRITORIES** | | | | | | | | | |
| A&N Islands | - | 0.70 | 2.35 | 1.55 | 4.97 | 9.41 | 3.67 | 15.24 | 29.94 |
| Arunachal Pradesh | - | - | - | | 10.04 | 22.96 | 11.99 | 90.92 | 195.64 |
| Chandigarh | - | - | - | 0.01 | 0.10 | 0.19 | 0.22 | 0.77 | 2.26 |
| Dadra & Nagar Haveli | - | - | - | 0.14 | 0.77 | 0.57 | 0.33 | 3.49 | 8.89 |
| Delhi | 0.68 | 0.90 | 4.79 | 6.29 | 16.34 | 33.77 | 19.96 | 172.91 | 270.26 |
| Goa, Daman & Diu* | - | - | 2.16 | 2.90 | 6.61 | 9.28 | 6.20 | 34.67 | 49.17 |
| Lakashdweep | - | - | - | - | 0.01 | 0.09 | 0.05 | 1.89 | 2.91 |
| Mizoram | - | - | - | - | 3.07 | 15.22 | 7.97 | 54.48 | 105.90 |
| Pondicherry | 0.11 | 0.40 | 0.53 | 0.31 | 1.32 | 2.47 | 1.46 | 8.23 | 12.59 |
| TOTAL 'B' | 0.79 | 2.00 | 9.83 | 11.20 | 43.23 | 93.96 | 51.85 | 382.60 | 677.56 |
| OTHERS 'C' | 0.81 | 1.42 | 1.54 | 2.26 | - | | - | - | - |
| TOTAL (A+B+C) | 129.40 | 251.43 | 434.82 | 306.33 | 838.50 | 1622.65 | 1005.32 | 4693.62 | 7144.49 |

*Arunachal Pradesh, Goa and Mizoram are now states.

ANNEXURE-VI

# TYPICAL FEATURES OF MOBILE MAINTENANCE UNIT

## A. TOOLS AND PLANT

| | | |
|---|---|---|
| 1. | Patcher | 2 Nos. |
| 2. | Light Commercial Vehicle (LCV) | 1 No. |
| 3. | Air Compressor | 1 No. |
| 4. | Bitumen Boiler | 1 No. |
| 5. | Mechanical Sprayer | 1 No. |
| 6. | Walk behind Roller | 1 No. |
| 7. | Plate Compactor | 1 No. |
| 8. | Pneumatic Tools | 2 Nos. |
| 9. | Grass Cutter | 1 No. |
| 10. | Wheel Barrows | 3 Nos. |

## B. LABOUR AND SKILLED OPERATORS

**Skilled Operators**

| | | |
|---|---|---|
| - | Driver | 1 No. |
| - | Operator Patcher | 2 Nos. |
| - | Mechanic | 1 No. |
| - | Operator (Walk behind roller) | 1 No. |

**Labour**

| | | |
|---|---|---|
| - | Mate/incharge | 1 No. |
| - | Labour for patcher | 2 Nos. |
| - | Labour bitumen boiler | 4 Nos. |
| - | Labour pneumatic tools and sweeping | 2 Nos. |

**ANNEXURE-VII-A**

# ZONE WISE DETAILS M&R NORMS FOR ONE KM OF SH/MDR OF HILL ROAD (SINGLE LANE)

ZONE-I

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | Over 450 CVD | |
| | | BT | WBM | BT | WBM |
| (A) | **ORDINARY-REPAIRS** | | | | |
| (I) | LABOUR-BELDAR | 6480 | 6480 | 6480 | 6480 |
| | | (0.3) | (0.3) | (0.3) | (0.3) |
| | MISTRI | 864 | 864 | 864 | 864 |
| | | (0.04) | (0.04) | (0.04) | (0.04) |
| (II) | PATCH AREA | 5.5% | 5.5% | 6.0% | 5.5% |
| | (a) B.T. SURFACE | | | | |
| | - BITUMEN | 9761 | - | 10664 | - |
| | - AGGREGATES | ($227m^2$@43/-) | - | ($248m^2$@43/-) | - |
| | (b) WBM | | | | |
| | - METAL | - | 4086 | - | 4086 |
| | | - | ($227m^2$@18/-) | - | ($227m^2$@18/-) |
| (III) | ARBORICULTURE | 300 | 300 | 300 | 300 |
| (IV) | PARAPET REPAIRS | 1500 | 1500 | 1500 | 1500 |
| (V) | STORE HOURS SHED | 500 | 500 | 500 | 500 |
| (VI) | CROSS-DRAINAGE WORKS, BRIDGES, CLEANING OF SCUPPERS, RECONSTRUCTION OF TOE WALL, PROTECTION WALLS | 2500 | 2500 | 2500 | 2500 |
| (VII) | SIGN BOARDS, KM. STONES | 1000 | 1000 | 1000 | 1000 |
| (VIII) | TRAFFIC CENSUS | 300 | 300 | 300 | 300 |
| | TOTAL FOR ORD. REPAIRS | 23205 | 17530 | 24108 | 17530 |
| (B) | **MAJOR REPAIRS** | | | | |
| (I) | REPAIRS TO RETAINING/ BREAST WALLS | 2500 | 1500 | 2500 | 1500 |
| (II) | REMOVAL OF SLIPS & SNOW CLEARANCE (UPTO 1.0m DEPTH) | 2500 | 1500 | 2500 | 1500 |
| (III) | REPAIRS TO DRAINS & RECONSTRUCTION OF DAMAGED WORKS | 1000 | 1000 | 1000 | 1000 |

ANNEXURE-VII-A (Contd.)

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | Over 450 CVD | |
| | | BT | WBM | BT | WBM |
| (C) | **PERIODICAL RENEWALS** | | | | |
| | | PC/6 | MR/5 | PC/5 | MR/4 |
| (I)* | SDC/PC & SC/SD | 23750 | - | 28500 | - |
| (II) | METAL RENEWAL | - | 15200 | - | 19000 |
| **(D)** | **SPECIAL REPAIRS** | 2000 | 2000 | 2000 | 2000 |
| **(E)** | **FLOOD DAMAGE FOR BREACHES & WASHING AWAY OF BRIDGES @ 12.5% OF (A+C)** | 5869 | 4091 | 6576 | 4566 |
| | G. TOTAL | 60824 | 42821 | 67184 | 47096 |
| | Say | 61000 | 43000 | 67000 | 47000 |

* SD - SURFACE DRESSING
PC & SC- PREMIX CARPET WITH SEAL COAT
SDC - SEMI DENSE CARPET

NOTES :

1. THESE NORMS ARE FOR HILL ROAD FALLING IN AREAS HAVING RAINFALL BETWEEN 1500-3000 MM/ANNUM.

2. "PROVISION FOR MAJOR REPAIRS AS PER (B) ABOVE MAY BE REDUCED BY 15% FOR ROADS IN AREAS HAVING RAINFALL LESS THAN 1500 MM AND INCREASED BY 15% FOR ROADS IN AREAS HAVING RAINFALL MORE THAN 3000 MM. NO REDUCTION WILL BE MADE FOR ROADS IN HIGH ALTITUDE AREAS EVEN IF THE RAINFALL IS LESS THAN 1500 MM".

3. FOR TWO LANE ROAD AND INTERMEDIATE LANE ROADS, THE ABOVE RATES OF SINGLE LANE SHOULD BE MULTIPLIED BY 1.6 AND 1.3 RESPECTIVELY.

**ANNEXURE-VII-B**

# ZONE WISE DETAILS M&R NORMS FOR ONE KM OF SH/MDR OF HILL ROAD (SINGLE LANE)

ZONE-II

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | Over 450 CVD | |
| | | BT | WBM | BT | WBM |
| (A) | **ORDINARY-REPAIRS** | | | | |
| (I) | LABOUR-BELDAR | 6480 (0.3) | 6480 (0.5) | 6480 (0.3) | 6480 (0.3) |
| | MISTRI | 864 (0.04) | 864 (0.04) | 864 (0.04) | 864 (0.04) |
| (II) | PATCH AREA | 5.5% | 5.5% | 6.0% | 5.5% |
| | (a) B.T. SURFACE - BITUMEN | 11804 | - | 12896 | - |
| | - AGGREGATES | ($227m^2$@52/-) | - | ($248m^2$@52/-) | - |
| | (b) WBM - METAL | - | 6583 | - | 6583 |
| | | - | ($227m^2$@29/-) | - | ($227m^2$@29/-) |
| (III) | ARBORICULTURE | 300 | 300 | 300 | 300 |
| (IV) | PARAPET REPAIRS | 1500 | 1500 | 1500 | 1500 |
| (V) | STORE HOUSE SHED | 500 | 500 | 500 | 500 |
| (VI) | CROSS-DRAINAGE WORKS, BRIDGES, CLEANING OF SCUPPERS, RECONSTRUCTION OF TOE WALL, PROTECTION WALLS | 2500 | 2500 | 2500 | 2500 |
| (VII) | SIGN BOARDS, KM. STONES | 1000 | 1000 | 1000 | 1000 |
| (VIII) | TRAFFIC CENSUS | 300 | 300 | 300 | 300 |
| | TOTAL FOR ORD. REPAIRS | 25248 | 20027 | 26340 | 20027 |
| (B) | **MAJOR REPAIRS** | | | | |
| (I) | REPAIRS TO RETAINING/ BREAST WALLS | 2500 | 1500 | 2500 | 1500 |
| (II) | REMOVAL OF SLIPS & SNOW CLEARANCE (UPTO 1.0m DEPTH) | 2500 | 1500 | 2500 | 1500 |
| (III) | REPAIRS TO DRAINS & RECONSTRUCTION OF DAMAGED WORKS | 1000 | 1000 | 1000 | 1000 |

ANNEXURE-VII-B (Contd.)

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | Over 450 CVD | |
| | | BT | WBM | BT | WBM |
| (C) | **PERIODICAL RENEWALS** | | | | |
| | | PC/6 | MR/5 | PC/5 | MR/4 |
| (I)* | SDC/PC & SC/SD | 28833 | - | 34600 | - |
| (II) | METAL RENEWAL | - | 24300 | - | 30375 |
| (D) | **SPECIAL REPAIRS** | 2000 | 2000 | 2000 | 2000 |
| (E) | **FLOOD DAMAGE FOR BREACHES & WASHING AWAY OF BRIDGES @ 12.5% OF (A+C)** | 6760 | 5541 | 7617 | 6300 |
| | G. TOTAL | 68841 | 55868 | 76557 | 62702 |
| | | Say 69000 | 56000 | 76500 | 62500 |

* SD - SURFACE DRESSING
PC & SC-SDC - PREMIX CARPET WITH SEAL COAT
SEMI DENSE CARPET

NOTES :

1. THESE NORMS ARE FOR HILL ROAD FALLING IN AREAS HAVING RAINFALL BETWEEN 1500-3000 MM/ANNUM.

2. "PROVISION FOR MAJOR REPAIRS AS PER (B) ABOVE MAY BE REDUCED BY 15% FOR ROADS IN AREAS HAVING RAINFALL LESS THAN 1500 MM AND INCREASED BY 15% FOR ROADS IN AREAS HAVING RAINFALL MORE THAN 3000 MM. NO REDUCTION WILL BE MADE FOR ROADS IN HIGH ALTITUDE AREAS EVEN IF THE RAINFALL IS LESS THAN 1500 MM".

3. FOR TWO LANE ROAD AND INTERMEDIATE LANE ROADS, THE ABOVE RATES OF SINGLE LANE SHOULD BE MULTIPLIED BY 1.6 AND 1.3 RESPECTIVELY.

**ANNEXURE-VII-C**

# ZONE WISE DETAILS M&R NORMS FOR ONE KM OF SH/MDR OF HILL ROAD (SINGLE LANE)

ZONE-III

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | Over 450 CVD | |
| | | BT | WBM | BT | WBM |
| (A) | **ORDINARY-REPAIRS** | | | | |
| (I) | LABOUR-BELDAR | 6480 (0.3) | 6480 (0.3) | 6480 (0.3) | 6480 (0.3) |
| | MISTRI | 864 (0.04) | 864 (0.04) | 864 (0.04) | 864 (0.04) |
| (II) | PATCH AREA | 5.5% | 5.5% | 6.0% | 5.5% |
| | (a) B.T. SURFACE | | | | |
| | - BITUMEN | 13847 | - | 15128 | - |
| | - AGGREGATES | ($227m^2$@61/-) | - | ($248m^2$@61/-) | - |
| | (b) WBM | | | | |
| | - METAL | - | 6583 | - | 6583 |
| | - MOORUM | - | ($227m^2$@29/-) | - | ($227m^2$@29/-) |
| (III) | ARBORICULTURE | 300 | 300 | 300 | 300 |
| (IV) | PARAPET REPAIRS | 1500 | 1500 | 1500 | 1500 |
| (V) | STORE HOUSE SHED | 500 | 500 | 500 | 500 |
| (VI) | CROSS-DRAINAGE WORKS, BRIDGES, CLEANING OF SCUPPERS, RECONSTRUCTION OF TOE WALL, PROTECTION WALLS | 2500 | 2500 | 2500 | 2500 |
| (VII) | SIGN BOARDS, KM. STONES | 1000 | 1000 | 1000 | 1000 |
| (VIII) | TRAFFIC CENSUS | 300 | 300 | 300 | 300 |
| | TOTAL FOR ORD. REPAIRS | 27291 | 20027 | 28572 | 20027 |
| (B) | **MAJOR REPAIRS** | | | | |
| (I) | REPAIRS TO RETAINING/ BREAST WALLS | 2500 | 1500 | 2500 | 1500 |
| (II) | REMOVAL OF SLIPS & SNOW CLEARANCE (UPTO 1.0m DEPTH) | 2500 | 1500 | 2500 | 1500 |
| (III) | REPAIRS TO DRAINS & RECONSTRUCTION OF DAMAGED WORKS | 1000 | 1000 | 1000 | 1000 |

ANNEXURE-VII-C (Contd.)

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | Over 450 CVD | |
| | | BT | WBM | BT | WBM |
| (C) | **PERIODICAL RENEWALS** | | | | |
| | | PC/6 | MR/5 | PC/5 | MR/4 |
| (I)* | SDC/PC & SC/SD | 33500 | - | 40200 | - |
| (II) | METAL RENEWAL | - | 24300 | - | 30375 |
| (D) | **SPECIAL REPAIRS** | 2000 | 2000 | 2000 | 2000 |
| (E) | **FLOOD DAMAGE FOR BREACHES & WASHING AWAY OF BRIDGES @ 12.5% OF (A+C)** | 7599 | 5541 | 8596 | 6300 |
| | G. TOTAL | 76390 | 55868 | 85368 | 62702 |
| | Say | 76500 | 56000 | 85500 | 62500 |

* SD - SURFACE DRESSING
PC & SC - PREMIX CARPET WITH SEAL COAT
SDC - SEMI DENSE CARPET

NOTES :

1. THESE NORMS ARE FOR HILL ROAD FALLING IN AREAS HAVING RAINFALL BETWEEN 1500-3000 MM/ANNUM.

2. "PROVISION FOR MAJOR REPAIRS AS PER (B) ABOVE MAY BE REDUCED BY 15% FOR ROADS IN AREAS HAVING RAINFALL LESS THAN 1500 MM AND INCREASED BY 15% FOR ROADS IN AREAS HAVING RAINFALL MORE THAN 3000 MM. NO REDUCTION WILL BE MADE FOR ROADS IN HIGH ALTITUDE AREAS EVEN IF THE RAINFALL IS LESS THAN 1500 MM".

3. FOR TWO LANE ROAD AND INTERMEDIATE LANE ROADS, THE ABOVE RATES OF SINGLE LANE SHOULD BE MULTIPLIED BY 1.6 AND 1.3 RESPECTIVELY.

**ANNEXURE-VII-D**

# ZONE WISE DETAILS M&R NORMS FOR ONE KM OF ODR/VR OF HILL ROADS (SINGLE LANE)

ZONE-I

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | | |
| | | BT | WBM | KATCHA | BRIDLE ROAD |
| (A) | **ORDINARY-REPAIRS** | | | | |
| (I) | LABOUR-BELDAR | 6480<br>(0.3) | 6480<br>(0.3) | 6480<br>(0.3) | 1080<br>(0.5) |
| | MISTRI | 864<br>(0.04) | 864<br>(0.04) | 864<br>(0.04) | 144<br>(0.00667) |
| (II) | PATCH AREA | 5.0% | 4.0% | - | - |
| | (a) B.T. SURFACE | | | | |
| | - BITUMEN | 8858 | - | - | - |
| | - AGGREGATE | ($206m^2$@43/-) | - | - | - |
| | (b) WBM | | | | |
| | - METAL | - | 2970 | - | - |
| | | - | ($165m^2$@18/-) | - | - |
| (III) | ARBORICULTURE | 150 | 100 | 50 | - |
| (IV) | PARAPET REPAIRS | 1000 | 700 | 300 | 300 |
| (V) | STORE HOUSE SHED | 400 | 300 | 200 | - |
| (VI) | CROSS-DRAINAGE WORKS, BRIDGES, CLEANING OF SCUPPERS, RECONSTRUCTION OF TOE WALL, PROTECTION WALLS | 1500 | 1000 | 500 | 400 |
| (VII) | SIGN BOARDS, KM. STONES AND WHITE WASH | 200 | 150 | 100 | 100 |
| (VIII) | TRAFFIC CENSUS | 100 | 50 | | |
| | TOTAL FOR ORD. REPAIRS | 19552 | 12614 | 8494 | 2024 |
| (B) | **MAJOR REPAIRS** | | | | |
| (I) | REPAIRS TO RETAINING/ BREAST WALLS | 1500 | 1500 | 1000 | 400 |
| (II) | REMOVAL OF SLIPS & SNOW CLEARANCE (UPTO 1.0m DEPTH) | 1500 | 1500 | 1000 | 1000 |
| (III) | REPAIRS TO DRAINS & RECONSTRUCTION OF DAMAGED WORKS | 1000 | 1000 | 1000 | 100 |

ANNEXURE-VII-D (Contd.)

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | Over 450 CVD | |
| | | BT | WBM | BT | WBM |
| (C) | **PERIODICAL RENEWALS** | | | | |
| | | PC/6 | MR/5 | - | - |
| (I)* | SDC/PC & SC/SD | 23750 | - | - | - |
| (II) | METAL RENEWAL | - | 15200 | 7600 (0.10m thick in 100 m length) | - |
| (D) | SPECIAL REPAIRS | 1500 | 1500 | 1500 | 1200 |
| (E) | **FLOOD DAMAGE FOR BREACHES & WASHING AWAY OF BRIDGES @ 12.5% OF (A+C)** | 5413 | 3477 | 2012 | 253 |
| | G. TOTAL | 54215 | 36791 | 22606 | 4977 |
| | Say | 54000 | 37000 | 22500 | 5000 |

* SD - SURFACE DRESSING
PC & SC - PREMIX CARPET WITH SEAL COAT
SDC - SEMI DENSE CARPET

NOTES :

1. THESE NORMS ARE FOR HILL ROAD FALLING IN AREAS HAVING RAINFALL BETWEEN 1500-3000 MM/ANNUM.

2. "PROVISION FOR MAJOR REPAIRS AS PER (B) ABOVE MAY BE REDUCED BY 15% FOR ROADS IN AREAS HAVING RAINFALL LESS THAN 1500 MM AND INCREASED BY 15% FOR ROADS IN AREAS HAVING RAINFALL MORE THAN 3000 MM. NO REDUCTION WILL BE MADE FOR ROADS IN HIGH ALTITUDE AREAS EVEN IF THE RAINFALL IS LESS THAN 1500 MM".

3. FOR TWO LANE ROAD AND INTERMEDIATE LANE ROADS, THE ABOVE RATES OF SINGLE LANE SHOULD BE MULTIPLIED BY 1.6 AND 1.3 RESPECTIVELY.

**ANNEXURE-VII-E**

# ZONE WISE DETAILS M&R NORMS FOR ONE KM OF ODR/VR OF HILL ROADS (SINGLE LANE)

ZONE-II

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | | |
| | | BT | WBM | KATCHA | BRIDLE ROAD |
| (A) | **ORDINARY-REPAIRS** | | | | |
| (I) | LABOUR-BELDAR | 6480 (0.3) | 6480 (0.3) | 6480 (0.3) | 1080 (0.05) |
| | MISTRI | 864 (0.04) | 864 (0.04) | 864 (0.04) | 144 (0.00667) |
| (II) | PATCH AREA | 5.0% | 4.0% | - | - |
| | (a) B.T. SURFACE | | | | |
| | - BITUMEN | 10712 | - | - | - |
| | - AGGREGATES | ($206m^2$@52/-) | - | - | - |
| | (b) WBM | | | | |
| | -METAL | - | 4785 | - | - |
| | | - | ($165m^2$@29/-) | | |
| (III) | ARBORICULTURE | 150 | 100 | 50 | - |
| (IV) | PARAPET REPAIRS | 1000 | 700 | 300 | 300 |
| (V) | STORE HOUSE SHED | 400 | 300 | 200 | - |
| (VI) | CROSS-DRAINAGE WORKS, BRIDGES, CLEANING OF SCUPPERS, RECONSTRUCTION OF TOE WALL, PROTECTION WALLS | 1500 | 1000 | 500 | 400 |
| (VII) | SIGN BOARDS, KM. STONES AND WHITE WASH | 200 | 150 | 100 | 100 |
| (VIII) | TRAFFIC CENSUS | 100 | 50 | - | - |
| | TOTAL FOR ORD. REPAIRS | 21406 | 14429 | 8494 | 2029 |
| (B) | **MAJOR REPAIRS** | | | | |
| (I) | REPAIRS TO RETAINING/ BREAST WALLS | 1500 | 1500 | 1000 | 400 |
| (II) | REMOVAL OF SLIPS & SNOW CLEARANCE (UPTO 1.0m DEPTH) | 1500 | 1500 | 1000 | 1000 |
| (III) | REPAIRS TO DRAINS & RECONSTRUCTION OF DAMAGED WORKS | 1000 | 1000 | 1000 | 100 |

ANNEXURE-VII-E (Contd.)

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | | |
| | | BT | WBM | KATCHA | BRIDLE ROAD |
| (C) | **PERIODICAL RENEWALS** | | | | |
| | | PC/6. | MR/5 | - | - |
| (I)* | SDC/PC & SC/SD | 28833 | - | - | - |
| (II) | METAL RENEWAL | - | 24300 | 12150 (0.10m thick in 100m length) | - |
| (D) | **SPECIAL REPAIRS** | 1500 | 1500 | 1500 | 1200 |
| (E) | **FLOOD DAMAGE FOR BREACHES & WASHING AWAY OF BRIDGES @ 12.5% OF (A+C)** | 6280 | 4841 | 2580 | 253 |
| | G. TOTAL | 62019 | 49070 | 27724 | 4977 |
| | | Say 62000 | 49000 | 27500 | 5000 |

* SD - SURFACE DRESSING
PC & SC - PREMIX CARPET WITH SEAL COAT
SDC - SEMI DENSE CARPET

NOTES :

1. THESE NORMS ARE FOR HILL ROAD FALLING IN AREAS HAVING RAINFALL BETWEEN 1500-3000 MM/ANNUM.

2. "PROVISION FOR MAJOR REPAIRS AS PER (B) ABOVE MAY BE REDUCED BY 15% FOR ROADS IN AREAS HAVING RAINFALL LESS THAN 1500 MM AND INCREASED BY 15% FOR ROADS IN AREAS HAVING RAINFALL MORE THAN 3000 MM. NO REDUCTION WILL BE MADE FOR ROADS IN HIGH ALTITUDE AREAS EVEN IF THE RAINFALL IS LESS THAN 1500 MM".

3. FOR TWO LANE ROAD AND INTERMEDIATE LANE ROADS, THE ABOVE RATES OF SINGLE LANE SHOULD BE MULTIPLIED BY 1.6 AND 1.3 RESPECTIVELY.

**ANNEXURE-VII-F**

# ZONE WISE DETAILS M&R NORMS FOR ONE KM OF ODR/VR OF HILL ROADS (SINGLE LANE)

ZONE-III

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | | |
| | | BT | WBM | KATCHA | BRIDLE ROAD |
| **(A)** | **ORDINARY-REPAIRS** | | | | |
| (I) | LABOUR-BELDAR | 6480<br>(0.3) | 6480<br>(0.3) | 6480<br>(0.3) | 1080<br>(0.05) |
| | MISTRI | 864<br>(0.04) | 864<br>(0.04) | 864<br>(0.04) | 144<br>(0.00667) |
| (II) | PATCH AREA 5.0% | 4.0% | - | - | |
| | (a) B.T. SURFACE | | | | |
| | - BITUMEN | 12566 | - | - | - |
| | - AGGREGATE | ($206m^2$@61/-) | - | - | - |
| | (b) WBM | | | | |
| | -METAL | - | 4785 | - | - |
| | | - | ($165m^2$@29/-) | | |
| (III) | ARBORICULTURE | 150 | 100 | 50 | - |
| (IV) | PARAPET REPAIRS | 1000 | 700 | 300 | 300 |
| (V) | STORE HOUSE SHED | 400 | 300 | 200 | - |
| (VI) | CROSS-DRAINAGE WORKS, BRIDGES, CLEANING OF SCUPPERS, RECONSTRUCTION OF TOE WALL, PROTECTION WALLS | 1500 | 1000 | 500 | 400 |
| (VII) | SIGN BOARDS, KM. STONES AND WHITE WASH | 200 | 150 | 100 | 100 |
| (VIII) | TRAFFIC CENSUS | 100 | 50 | - | - |
| | TOTAL FOR ORD. REPAIRS | 23260 | 14429 | 8494 | 2024 |
| **(B)** | **MAJOR REPAIRS** | | | | |
| (I) | REPAIRS TO RETAINING/ BREAST WALLS | 1500 | 1500 | 1000 | 400 |
| (II) | REMOVAL OF SLIPS & SNOW CLEARANCE (UPTO 1.0m DEPTH) | 1500 | 1500 | 1000 | 1000 |
| (III) | REPAIRS TO DRAINS & RECONSTRUCTION OF DAMAGED WORKS | 1000 | 1000 | 1000 | 100 |

ANNEXURE-VII-F (Contd.)

| | | Traffic Density | | | |
|---|---|---|---|---|---|
| | | Less Than 450 CVD | | | |
| | | BT | WBM | KATCHA | BRIDLE ROAD |
| (C) | **PERIODICAL RENEWALS** | | | | |
| | | PC/6 | MR/5 | - | - |
| (I)* | SDC/PC & SC/SD | 33500 | - | - | - |
| (II) | METAL RENEWAL | - | 24300 | 12150 (0.10m thick in 100m length) | - |
| (D) | **SPECIAL REPAIRS** | 1500 | 1500 | 1300 | 1200 |
| (E) | **FLOOD DAMAGE FOR BREACHES & WASHING AWAY OF BRIDGES @ 12.5% OF (A+C)** | 7095 | 4841 | 2580 | 253 |
| | G. TOTAL | 69355 | 42070 | 27524 | 4977 |
| | Say | 69500 | 49000 | 27500 | 5000 |

* SD - SURFACE DRESSING
PC & SC - PREMIX CARPET WITH SEAL COAT
SDC - SEMI DENSE CARPET

NOTES :

1. THESE NORMS ARE FOR HILL ROAD FALLING IN AREAS HAVING RAINFALL BETWEEN 1500-3000 MM/ANNUM.

2. "PROVISION FOR MAJOR REPAIRS AS PER (B) ABOVE MAY BE REDUCED BY 15% FOR ROADS IN AREAS HAVING RAINFALL LESS THAN 1500 MM AND INCREASED BY 15% FOR ROADS IN AREAS HAVING RAINFALL MORE THAN 3000 MM. NO REDUCTION WILL BE MADE FOR ROADS IN HIGH ALTITUDE AREAS EVEN IF THE RAINFALL IS LESS THAN 1500 MM".

3. FOR TWO LANE ROAD AND INTERMEDIATE LANE ROADS, THE ABOVE RATES OF SINGLE LANE SHOULD BE MULTIPLIED BY 1.6 AND 1.3 RESPECTIVELY.

**ANNEXURE-VIII**

# TYPICAL RATE ANALYSIS OF ORDINARY REPAIRS (COST ANALYSIS FOR 1 KM LENGTH HAVING 3.75 M WIDE CARRIAGEWAY)

**1. Labour**

(a) For SH/MDR/ODR/VR (BT OR WBM OR KATCHA)

It shall be 0.3 labour/km
Av. monthly wages = 1800
So yearly wage reqd./km = 0.3x1800x12 = 6480/-

(b) For Briddle road

Equivalent Labour of (a) to be employed only for 2 months
Hence yearly wage/km = $\frac{6480}{6}$ 1080/-

**2. Mate**

(a) For SH/MDR/ODR/VR(BT)/WBM OR KATCHA)

It shall be 0.04/km
Av. daily wage = 60/- A.V. monthly wage = 1800/-

So yearly wage reqd. = 1800x12x.04 864/-

(b) For Briddle road

As in I(b), it shall also be for 2 months
Hence yearly wage = $\frac{864}{6}$ 144/-

**3. Arboriculture :- it is taken LS as given in Annexure.**

**4. Parapet Repairs**

(a) For SH & MDR

Assuring 120 parapets/km, damaged No. supposing 5/km
Cost of repairs = 5x313 = 1565 Say 1500/-

(b) For ODR/VR

(2) BT Assuring 3 parapets damaged Say 1000/-
Cost = 3x313 = 939

(ii) WBM Assuring 2 parapets damaged Say 700/-
Cost = 2x313 = 626

(iii) Kacha Assuring 1 parapets damaged Say 300/-
Cost = 1x313 = 313

(c) For Briddle road
Assuring 1 parapets damaged Say 300/-
Cost = 1x313 = 313

**5. Store House and shed**

It is provided L5 as given in Annexure.

**6. C.D. Works & Bridge**

| | | | | |
|---|---|---|---|---|
| (a) | For SH & MDR | | | |
| | | Clearing of Scuppers 8 Nos./km (a) 125 | = | 1000/- |
| | | Repair of RW/BW/Toe Wall etc. LS | = | 1500/- |
| | | | | 2500/- |
| (b) | ODR/VR | | | |
| (2) | B.T. | Clearing of Scuppers 6 Nos. @ 200/- | = | 1200/- |
| | | Repair of RW/BW/Toe Wall etc. LS | = | 300/- |
| | | | | 1500/- |
| (ii) | | Clearing of 4 Nos. Scuppers @ 200/- | = | 800/- |
| | | Repair of RW/BW/TW etc. LS | = | 200/- |
| | | | | 1000/- |
| (iii) | | Katcha | | |
| | | Clearing of 2 Nos. Scuppers @ 200/- | = | 400/- |
| | | Repair of RW/BW/TW etc. LS | = | 100/- |
| | | | | 500/- |

(iv) Briddle Road

It is taken as L.S. as given in Table.

**7. Sign Board, KM Stones, White Wash etc.**

It is taken as L.S. as given in Annexure for ODR/VR and has been analysed for SH/MDR as follows

| | | | |
|---|---|---|---|
| (2) | For SH & MDR | | |
| | Repainting of Sign & Caution Boards 6 Nos. @ 50/- | | 300/- |
| (ii) | H.M. Stones 4 Nos. @ 10/- | | 40/- |
| | KM Stone 1 No. @ 50/- | | 50/- |
| (iii) | Numbering of Scupper 10x4 = 40 Nos. @ 8/- | | 320/- |
| (iv) | Repainting of Bridge & Culverts railing LS | | 100/- |
| (v) | White washing of Road side driving, edge stone Parapets and Hill sides, 2 times a year with other misc. items LS | | 200/- |
| | | | 1010 |
| | | Say | 1,000 |

**8. Traffic Census**

It is taken as L.S. as given in Annexure. No traffic census assumed to be one on Katcha and Briddle roads.

**9. Repair to BM/RW/Bed Bars etc.**

It is taken as L.S. as given in Annexure.

## 10. Removal of slips & Snow clearance

| | | SH & MDR | | | | ODR/VR | | | Bridle Road |
|---|---|---|---|---|---|---|---|---|---|
| | | 450CV | | 450CV | | | | | |
| | | BT | WBM | BT | WBM | BT | WBM | Katcha | |
| 1. | Removal of Slips (Manual) | 200m$^3$ | 200m$^3$ | 200m$^3$ | 200m$^3$ | 50m$^3$ | 50m$^3$ | 50m$^3$ | 100m$^3$ |
| | Snow | @6/m$^3$ | @6/m$^3$ | @6/m$^3$ | @6/m$^3$ | @6/m$^3$ | @6/m$^3$ | @6/m$^3$ | @6/m$^3$ |
| | | 1200 | 1200 | 1200 | 1200 | 300 | 300 | 300 | 600 |
| 2. | Removal by Dozer (LS) | 1300 | 300 | 1300 | 300 | 1200 | 1200 | 700 | 400 |
| | (Slips Snow) | 2500 | 1500 | 2500 | 1500 | 1500 | 1500 | 1000 | 1000 |

## 11. Repairs to drains and reconstruction of damaged works

(a) For SH & MDR

(i) 4 persons are reqd. of down and maintain 100 km in a year

Hence cost/km = $\frac{4}{100}$ x 1800x12 = 864/-

(ii) Cost of material required in above LS = 150/-

1014/-

Say 1000/-

(b) For ODR/VR

It is taken L.S. as given in Annexure.

**ANNEXURE-IX**

## Typical Rate Analysis for One Coat Surface Dressing (SD) as a Renewal Coat (Cost Analysis for 1 km length having 3.75 m wide carriageway)

Zone-I

Area = 3.75x1000+10% for curves = 4125$m^2$

**Materials**

1. Qty. of Bitumen @ 11 kg/10$m^2$

$$= 4125 \times \frac{11}{1000} \times \frac{1}{10} = 4.53 \text{ MT}$$

2. Qty. of stone chips @ .1$m^3$/10$m^2$

$$= 4125 \times \frac{0.1}{10} = 41.25 \text{ cum}$$

3. Fuel wood for heating Bitumen 4.53T @ 4.5Qtl/MT = 20.38 Qtl

4. Diesel for 3 days @ 8 hrs/day and 8.5 lit/hr = 204 lit.

**Cost**

| | | | | |
|---|---|---|---|---|
| 1. | Bitumen 4.53 MT @ Rs.6000/- per MT | = | Rs. | 27180 |
| 2. | Stone chips 41.25 cu.m @ Rs.300/- per cum | = | Rs. | 12375 |
| 3. | Fuel wood 20.38 Qtl @ Rs.110/- Qtl | = | Rs. | 2242 |
| 4. | Diesel 204 @ Rs.5.5/- per litre | = | Rs. | 1122 |
| 5. | Labour charges 4125 sqm @ Rs.1.23/- sqm | = | Rs. | 5074 |
| | Labour charges for precoating 41.25 cum @ Rs.25.3/- cum | = | Rs. | 1044 |
| 6. | Miscellaneous items | | | |
| | i) Painting Kits. brushes etc. L.S. | = | Rs. | 1000 |
| | ii) Roller charges @ 500 per day for 3 days | = | Rs. | 1500 |
| | iii) Renewal of Patris/Edge Filling etc. L.S. | = | Rs. | 4500 |
| | | | Rs. | 56037 |
| | Add 10% for contingencies and contractor's profit | | Rs. | 5604 |
| | | Total | Rs. | 61641 |
| | Rate per km of single lane | Say | Rs. | 61500 |

**ANNEXURE-X**

## Typical Rate Analysis for 20mm PC with seal coat (Cost analysis for 1 km length having 3.75 m wide carriageway)

Zone-I

Area = 1000x3.75+10% for curves = 4125$m^2$

1. Qty. of Bitumen

| | |
|---|---|
| for tack coat | 5.00 kg/10$m^2$ |
| for P.C. | 14.60 kg/10$m^2$ |
| for seal coat (type B) | 6.80 kg/10$m^2$ |
| | 26.4 kg/10$m^2$ |

$$= 4125 \times \frac{26.4}{10} \times \frac{1}{1000} = 10.890 \text{ MT}$$

2. Qty. of Stone chips @ 0.27 cum/10$m^2$

$$= 4125 \times \frac{0.27}{10} = 111.38 \text{ cum}$$

3. Qty. of Sand @ 0.60 c.m/10$m^2$

$$= 4125 \times \frac{0.06}{10} = 24.75 \text{ cum}$$

**Cost**

| | | | | |
|---|---|---|---|---|
| 1. | Bitumen 10.89 MT @ Rs.6000/- per MT | | = | Rs. 65340 |
| 2. | Stone chips 111.38 cum @ Rs.300/- per cum | | = | Rs. 33414 |
| 3. | Sand 24.75 cum @ Rs.120/- per cum | | = | Rs. 2970 |
| 4. | Labour includng paver laying and compaction 111.38x1.6 = 178.20 MT @ Rs.130/- per MT | | = | Rs. 23166 |
| 5. | Labour including consolidation of seal coat 4125 $m^2$ @ Rs.1.10/$m^2$ | | = | Rs. 4538 |
| | | | | Rs. 129428 |
| | Add 10% for contingencies and contractor's profit | | | Rs. 12943 |
| | | Total | = | Rs. 142371 |
| | Rate per km of single lane | Say | = | Rs. 142500 |

**ANNEXURE-XI**

## Typical Rate Analysis for 25mm Semi-Dense carpet (SDC) (Cost analysis for 1 km length having 3.75 m wide carriageway)

Zone-I

Area = 1000x3.75+10% for curves = 4125 sqm

wt. of mix 4125x0.025x23 = 237.19 MT

1. Qty. of Bitumen @ 5.5% by wt. of mix

$$= 237.19 \times \frac{5.5}{100} = 13.05 \text{ MT}$$

Bitumen for Tack Coat @ 5 kg/10m$^2$ = 2.06 MT

Total Bitumen = 15.11 MT

2. Wt. of Stone chips = 156.90 MT
(237.19-13.05)x0.7

1 cum of chips weights = 1600 kg

$$\text{Qty. of stone chips} = \frac{156.90}{1.6} = 98.06 \text{ cum}$$

3. Wt. of Sand = (237.19-13.05)x0.2 = 44.83 MT

$$\text{Qty. of Sand} = \frac{44.83}{1.55} = 28.92 \text{ cum}$$

4. Wt. of filler = (237.10-13.05)x0.1 = 22.41 MT

1 cum of filler weighs = 2200 kg

$$\text{Qty. of Filler} = \frac{22.41}{2.2} = 10.19 \text{ cum}$$

Cost

| | | | |
|---|---|---|---|
| 1. | Bitumen 15.11 MT @ Rs.6000/- per MT | = | Rs. 90660 |
| 2. | Stone chips 98.06 MT @ Rs. 300/- per cum | = | Rs. 29418 |
| 3. | Sand 28.92 cum @ Rs.120/- per cum | = | Rs. 3470 |
| 4. | Filler 10.19 cum @ Rs.500/- per cum | = | Rs. 5095 |
| 5. | Laying and campacting 237.19 Mt @ Rs.130/- per MT | = | Rs. 30835 |
| | | | Rs. 159478 |
| | Add 10% for contingencies and contractor's profit | | Rs. 15948 |
| | | | Rs. 175426 |
| | Rate per km of single lane | Say | Rs. 175500 |

**ANNEXURE-XII**

## Typical Rate Analysis for 75 mm Metal Renewal (MR 75) (Cost Analysis for 1 km length having 3.75 m wide carriageway)

Zone-I

Area = 1000x3.75+10% for curves = 4125 $m^2$

1. Qty. of Stone metal

$$= 4125 \times \frac{100}{1000} = 412 \text{ cum (loose)}$$

Cost

| | | | |
|---|---|---|---|
| 1. | Stone metal 412 cu.m @ Rs.150/- per cum | = | Rs. 61800 |
| 2. | Labour for consolidation 412 cum @ Rs.18/- per cum | = | Rs. 7416 |
| | | | Rs. 69216 |
| | Add 10% for contingencies and contractor's profit | | Rs. 6922 |
| | | | Rs. 76138 |
| | Rate per km of single lane | Say | Rs. 76000 |

ANNEXURE-XIII

## Norms for Repair to Semi-Permanent Timber Bridges/Km Length of Road

| | | | |
|---|---|---|---|
| A. | Data (in respect of Assam) | | |
| | i) | Total length of S.P.T. bridges | 1,48,400 rm |
| | ii) | Length of roads having S.P.T. bridges | 30,000 km |
| | iii) | Length of S.P.T. bridges/km length of road | 5 rm |
| | iv) | Cost of construction of 5 rm of S.P.T. bridges @ Rs.25,000/rm | Rs. 1,25,000/- |
| | v) | Cost of timber component 65% of the total cost | Rs. 81,000/- |
| | vi) | Cost of timber superstructure and sub-structure (40:60) | |
| | | a) Super-structure | Rs. 32,400/- |
| | | b) Sub-structure | Rs. 48,600/- |
| B. | Cost of Maintenance | | |
| | i) | Cost of normal maintenance/km/yr considering @ 75% of timber super-structure | Rs. 2,400/- |
| | ii) | Cost of special repair/km/yr considering 12 yr. cycle for replacement of timber component | Rs. 6,750/- |
| | | Total cost | Rs. 9,150/- |
| | | Say | Rs. 9,000/- per km of road having SPT bridges |

Note : This would vary if the average of SPT bridges is not 5 rm/km of road.

**ANNEXURE-XIV**

# WORK REPORT

WORK SHEET NO. _____

WEEK FROM _____ TO _____

SECTION _____ FROM _____ TO _____

Quantity and Type of Work Done

i) Treating bleeding $m^2$ _____

ii) Cracks $m^2$ _____

iii) Potholes filling $m^2$ _____

Material utilised

Bitumen _____ kg or Tonnes _____

Aggregate _____ $m^3$ _____

Sand _____ $m^3$ _____

Note : "Quantity/type of work and materials/resources utilised on repairs/maintenance of parapets, CD works, bridges, breast/retaining/toe walls, drains, slide/snow clearance, km stones/sign boards etc. also may be included as per work done during the week".

ANNEXURE-XV

119/50

# FORMAT OF PERFORMANCE FOR MAINTENANCE (DIVISION LEVEL)

Division _____

Date _____

Circle _____

Qr _____

| Name of road | Budget allotment (Rs. Lakh) | Ordinary Repairs (Rs. lakh) | | | | Special Repairs Renewal/Restoration etc. | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Targets | | Achievements | | |
| | | Road Gangs (Labour) | Material | Others | Total | Job No. | Physical (km) | Financial (Rs. lakh) | Physical (km) | Financial (Rs. lakh) | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

**APPENDIX-I**

# MAIN RECOMMENDATIONS CONTAINED IN THE REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS, WHICH ARE CONSIDERED RELEVANT FOR HILL ROADS ALSO

1.1. The actual allocations made available to different States at present are only about 50 to 70 per cent of the requirements as per norms. This needs serious attention of policy makers to improve the situation. The whole attitude towards maintenance needs a change at all levels.

1.2. Investments in roads have been going down from a high of 6.5 per cent of public expenditure in First Plan to 3.0 per cent in the Eighth Plan. This inadequate outlay in Roads Sector is having serious impact on the economy. Allocations for roads need to be stepped up suitably. The first charge on the increase in plan outlays should be for strengthening of pavement, adequate drainage measures and reconstruction of weak bridges and culverts. This would in turn help in reducing the maintenance burden. Removal of deficiencies of existing roads should have priority over expansion of road network.

1.3. The Committee recommends that the Tenth Finance Commission may devise suitable mechanism so that the State Govts. make adequate provision in the budget for maintenance of roads and release the same so that the maintenance work receives the priority it deserves.

1.4. For increasing the efficiency of the road gangs, the scheme of mobile gangs may be introduced in more States on experimental basis and decisions taken for reorganisation of the maintenance operations for improved efficiency on the basis of experience thus gained. The feasibility of introducing some mechanisation in the maintenance operations may also be considered for adoption.

1.5. The ban on recruitment of labour should continue and be enforced strictly. In States where the existing road gang establishment is more than the prescribed norms, concerted efforts may be made by the concerned States to bring it down to the norms latest by 1995-96.

1.6. Existing gravel roads, where the traffic is more than 450 CVD, should preferably be converted to metalled/black topped road out of plan funds.

1.7. Priority in M&R should be given to periodic renewals. In fact a specific portion of the maintenance budget should be set apart for this activity. A minimum of 40 per cent should be aimed at.

1.8. Vehicle protective measures on stretches near village ponds needs special attention. These aspects should be kept in view while taking up any improvement works.

1.9. For optimum use of available funds, the State may institute Road Maintenance Management Systems so that a scientific assessment of maintenance treatments could be made based on traffic, road condition, climate and budget constraints.

1.10. Most of the major bridges were constructed during the Second to Fifth Five Year Plan periods. These bridges have now started showing signs of distress and need major attention for rehabilitation. There is need to have a proper Bridge Maintenance Management System.

1.11. The Indian Roads Congress (IRC) has brought out a number of publications on various aspects of maintenance operations which contain detailed instructions on execution and monitoring of the maintenance operations. The State PWDs and other executing agencies should utilise these publications.

1.12. The existing system of monitoring of maintenance activities and utilisation of funds in State PWDs need to be improved. The system should also have in-built mechanism of accountability in performance.

1.13. The Central Road Fund needs to be augmented and at least 50 per cent of this should be earmarked for maintenance and other preventive maintenance activities including strengthening.

1.14. The funds for maintenance may also be raised through roadside advertisements and commercial plantation.

1.15. The States may also consider levying some additional agricultural cess. The funds so generated could be spent exclusively on maintenance of rural roads. Also, the local bodies including panchayats should be authorised to levy cess on agricultural, industrial and rural household for maintaining roads within their jurisdiction.

1.16. Rural roads are being constructed through Jawahar Rojgar Yojana (JRY) funds as job creation schemes in rural areas. The Committee recommends that 30 per cent of such allotments should be earmarked for maintenance of assets created as this is equally labour intensive and thus help in job creation.

1.17. The practice of overloading of vehicles needs to be curbed and for this purpose effective enforcement of provisions in the Motor Vehicles Act is required. Strict enforcement need to be exercised. Otherwise roads get damaged rapidly resulting in poor condition requiring heavy outlays for maintenance and rehabilitation.

1.18. In order to improve the productivity of labour and immediate supervisory staff, proper training to maintenance labour/staff is essential and should be provided for.

1.19. The Ministry of Surface Transport (Roads Wing), being nodal Ministry for roads, and the Planning Commission should monitor and review allocation of M&R funds made by the States in their budget on year to year basis.

1.20. The norms for M&R may be reviewed after an interval of every five years to take into account changes in traffic patterns and technological advancements etc.

## 121.2 DIRECTIONS ON PROJECT PREPARATION AND CO-ORDINATION BETWEEN ROADS AND BRIDGES



## 121.3 AGENCY, OTHER CHARGES AND RECOVERIES



## 121.4 PROCEDURE FOR SUBMISSION OF CASES TO MINISTER, MOF, HQ, PEC & WORLD BANK



## 121.5 REVISED ESTIMATES, PERMISSIBLE EXCESS AND CHANGE OF SCOPE