GOVERNMENT OF KERALA

Abstract

Public Works Department – Road Bridge Maintenance Policy - Approved - Orders issued

PUBLIC WORKS (H) DEPARTMENT

G.O.(Ms)No. 72/2016/PWD Dated,Thiruvananthapuram,22/10/2016

ORDER

1. Kerala has a road density of 390 km per square km, which is roughly three times the National Average. Out of the 1,51,652 km of roads in Kerala, 1542 km are National Highways, 4341 km are State Highways and 32747 km are Major District Roads. Rest of the roads are of rural road category maintained by Local Self Government and other agencies. The National Highways are maintained by the Public Works Department for the Government of India (MoRTH). State Highways and Major District Roads are managed by Public Works Department with state funds.

2. The dense population and ribbon development on the road side, the ever increasing vehicle population coupled with the sub-optimal geometrical standards, narrow width and two rainy seasons extending upto 5 to 7 months a year, poor drainage facilities adversely affects the pavement condition. The fund allocation for maintenance had historically been low when considering the rate of deterioration of roads due to the above reasons.

3. It is essential to have a road maintenance policy for the upkeep of roads using latest technologies in road maintenance.The principal objective of the present Road Maintenance Policy is the proper up keep of roads using latest technologies and techniques in Road Maintenance. The purpose of the policy is to provide guiding frame-work for establishing the

objectives, making arrangements and establishing sets of procedures for the maintenance and repair of PWD roads to sustain the quality of the network.

4. The Policy envisions formation of a separate wing in PWD, under a Chief Engineer, exclusively to manage and operate the maintenance of the PWD roads. The principal function of the Chief Engineer (RM) is to prepare the Annual Roads Maintenance Operation Plan covering all the maintenance activities at the beginning of the Financial year and obtaining necessary funds. The comprehensive plan include (1) Evaluation and Prioritisation of the road pavement in terms of road characteristics including traffic and based on the Pavement Condition Index (PCI). Separate guide-lines for this shall be established considering the best practices. (2) Classification of maintenance operations for which intervention standards for routine maintenance (yearly), periodic maintenance covering overlays. Special repairs for strengthening the pavement when ever required, and emergency repairs. The periodicity of the renewal for SH and MDRs are also included in this policy.

5. The policy suggests that apart from the existing procedures, different maintanances/ modalities such as Performance Based Maintenance Contract, Public Private Partnership etc.shall also be adopted depending on the need. The policy suggests extensive usage of waste plastics, Natural Rubber modified Bitumin, Coir Geotextiles in the road maintenance works.

6. The Policy high lights the need to develop computerised systems for continuous monitoring of road condition, assessment of traffic, the quality testing for various construction materials used for maintenance and the capacity building of PWD Engineers on creation of awareness on contemporary development and best practices in the maintenance operations. The salient features of the policy are;

1. The road quality shall be maintained as per IRC standards on roughness and PCI indices.
2. Different types of maintenance strategy shall be followed according to type, traffic and importance of road and considering the Kerala conditions.

3. Penalty Clause on all contracts shall be strictly enforced.
4. Maintenance works shall be done, as far as possible, using State latest technologies equipments.
5. Road safety measures will be included with a view to reduce road accidents and fatalities.
6. Central Road Research Institute, New Delhi (CRRI) shall be made the nodal agency for all technical supports.
7. Road quality audit and road safety audit will be made mandatory.
8. Services of Educational Institutions and other agencies shall be made use of for maintenance, upkeep of roads, providing information duly guided by PWD.
9. Multi Media call centre shall be put in place under PWD to provide grievance redressal and better services to road users.

7. In the circumstances, Government are pleased to approve the Roads and Bridge maintenance policy as appended. The policy will be implemented from 1st April 2017 with appropriate institutional arrangements.

By Order of the Governor
SUBRATA BISWAS
ADDITIONAL CHIEF SECRETARY

To:- The Chief Engineer, PWD(NH/R&B/Building/Admn.),
Thiruvananthapuram
The Supdt Engineer PWD(NH/R&B/Building/Admn.)
The Accountant General, (A&E/Audit), Thiruvananthapuram
PS to Hon'ble Chief Minister
PS to Hon'ble Minister(W&Reg.)
PRD (Web & New Media)
GA(SC)Dept
PA to ACS (PWD)
CA to AS, PWD
SF/OC

Forwarded / By Order.

Section officer

The Policy

1. **Purpose:** The purpose of the policy is to provide a guiding frame work for establishing the objectives, making arrangements and establishing sets of procedures for the maintenance and repair of roads by Public Works Departments, Government of Kerala. The aim is to achieve a sustainable road network, leading to increasing standards overtime. Engineering staff will use their best efforts to maintain the road network to as high a standard as possible in accordance with this policy documents.

2. Objectives

1. The roads that fail, crack, get deformed or disintegrate present danger to road users in addition, to normal wear and tear imposed by vehicles, increase consumption of POL, delays in travel time and various other economic cost. There is a need for the concerned agencies and organizations to effect repairs and restoration of the roads in a timely and systematic manner.

   The objectives of the Policy are to enable:

   (i) Adequate, timely and sound maintenance of roads to provide safe, convenient and efficient access and service to road users in Kerala.

   (ii) Judicious & optimal utilization of available funds and resources for the maintenance and repair of the roads;

   (iii) Efficient maintenance by using appropriate technology, state of the art and effective repair treatments by inducting

new techniques and equipment in road repair and maintenance work.

(iv) Appropriate procedures of inspections, checks and technical audit.

(v) Keeping history sheet of maintenance (like, health chart) of every road, Kilometer-wise and year-wise, in a suitable format.

(vi) Capacity building and organizational development of the man power and agencies engaged in roads constructions, primarily maintenance and repair in the State for efficient discharge of road development and maintenance function

3 **Definition;** In this Policy,

(a) **Annual Road Maintenance Plan** means the Annual Roads Maintenance and Operations Plan for the State of Kerala for the roads maintained by PWD

(b) **Defect** means any form of failure in the road surface including cracks deformation and disintegrations. This types of failure can be structural or visual in nature.

4 **Implementation :** Public Works Department , Government of Kerala shall be responsible for the implementation of this Policy through Kerala Public Works Department

1. Planning unit

(i) Survey and data base (inventories)

(ii) Prioritorization

2. Delivery Unit

(i) Contract Procedures

(ii) Contract Documentation

(iii) Contracting arrangements

(iv) Execution of work and supervision

3. Monitoring and supervision

(i) Monitoring

(ii) Review and evaluation

(iii) Technical and financial auditing

5 Evaluation and prioritization of Roads

I. Kerala PWD shall carry out evaluation of the existing road pavement in terms of its physical condition, structural capacity, roughness etc. through Road Condition Surveys. Such surveys shall assess type, magnitude, location of the distressed roads and other physical parameters like roughness, skid resistance etc. It shall evaluate Pavement Condition Index (PCI) and take up Prioritization of roads on the basis of the PCI.

II. At least one condition survey should be conducted on each stretch of road every year during the month of January. The data collected methodologically- road – Kilometer wise.

III. Traffic data on SH and MDR should be collected, as per the procedure to be laid down by PWD. The traffic data should show classification of motorized, non-motorized, commercial vehicles etc. The traffic volume data shall also be used as an input in prioritization of maintenance work.

IV. The department shall identify different types of Roads maintenance activities and prepare a manual of technical practices to carry out the same

V. The planning of various maintenance operation will be correlated and looked upon as a total system rather than each activity being considered in isolation. Based on the condition evaluation, the causes for various defects observed should be examined in detail and a decision taken whether to initiate a particular maintenance activity.

VI. PWD shall establish guiding rules for prioritization of Road maintenance work, taking into account the evaluation carried out under this policy.

6 **Modality for implementation:**

6.1 Apart from existing procedures in carrying out Road Maintenance Works, PWD may adopt various models including Performance Based Maintenance Contract, Public Private Partnerships for various kinds of arrangement.

6.2 The services of Educational Institutions and other agencies situated in the locality shall be made use of for the maintenance and proper up keep of roads, duly guided by the PWD.

7 **Classification of maintenance operations**: The intervention and rectification standards for various maintenance activities shall be finalized for different categories of roads Maintenance Operations may be classified in four groups.

I. **Routine repair/ Maintenance** : Ordinary repairs and maintenance include pothole repair, crack ceiling , pavement edge and shoulder repair , clearance of side

drains , maintenance of embankment, cross drainage repair works, repair or replacement of road side furniture and road signage , bridge and culvert repairs, vegetation control, clearance of litter and debris etc.

II. **Periodic renewals/Maintenance**: Periodic renewals include leveling the surface, patch repairing and providing black topping by way of premix carpet or making seal surfacing (or white toping, where required). New techniques and materials and latest equipments shall be used extensively for carrying out for periodic renewal works. Use of plastic and NRMB ,Coir Geotextiles shall be given top priority

III. **Special repair/Maintenance**: Special repairs and flood damage repairs include (1) Special repairs like pavement riding quality improvement (PRQI) including any profile correction (2) Treatment of damages caused by floods, Cyclones and other natural calamities (III) Special repair of bridges and cross drainage structures.

IV. **Emergency repair or maintenance** refers emergency conditions like collapses or severe damages of road earth slippage or any other matter emergent in nature.

8 <u>Classification of Roads</u>: PWD shall classify the roads under its jurisdiction as the State Highways and Major Districts Roads. Latest recommendations of Indian Road Congress through its codes and special publication in respect of quality and specifications as regards quality with regard to surface and width of each class of roads along with that of the

Bridges, Culverts, Slip Roads, Signage, Safety requirements, crossing and other relevant features or appurtenances as required for safe and efficient use of the road shall be followed. However, PWD shall be at liberty to make any diversion to these recommendations by issuing separate instructions.

9 **Periodicity of Renewal**: The following broad guidelines, for the type and periodicity of renewals, may be utilized as a guide for working out the requirement of funds for the annual programme on different sections of roads.

10

I. <u>Renewal Interval for State Highways (Number of years)</u>

Type of Treatment/Category of Road	Traffic intensity in CVD	20mm MSS	30mm BC	40mm BC
SHs(Normal)	>4500	-	5	5
	1500-4500	-	5	-
	450-1500	5	-	-
	<450	5	-	-
SHs Urban	>4500	-	4	4
	1500-4500	-	4	-
	450-1500	4	-	-
	<450	4	-	-
SHs Hilly	>1500	-	4	4
	450-1500	-	4	-
	<450	5		

Renewal interval for MDR

Type of Treatment/Category of Road	Traffic intensity in CVD	20mm MSS	30mm BC
MDRs (Normal)	>1500	-	5
	450-1500	5	5
	150-450	5	-
	<150	-	-
MDR (Urban)	>1500	-	5
	450-1500	4	-
	150-450	4	-
	<150	4	-
MDR(Hilly)	>1500	-	4
	450-1500	4	4
	150-450	5	-
	<150	-	-

The periodicity of the renewal indicated in the table above will only be taken as general guidelines for the purpose of budgeting and determining the extent of renewal programme.

11. **Annual Roads Maintenance Operation Plan** : Kerala PWD shall prepare Annual Road Maintenance Operation Plan (ARMOP) covering State Highway and Major District Road , with due attention to management of the whole programme, based on availability of fund for road maintenance. It will identify the maintenance works on the state road network for different classes

the PWD taking into account the condition of roads bridges, culverts, roads signs and road appurtenances. The powers to sanction estimates of ordinary repair (Non Plan) will be as per relevant Government Order.

12. **Environmental Sustainability**:

12.1 In development , construction and maintenance of road schemes in rural and urban areas in supporting infrastructures, appurtenances, safety features etc. the Department shall make best possible efforts to implement technologies that are environmentally friendly, have a low carbon footprint and provide smooth access to all sections of society, including the disabled in a safe manner.

12.2 The Department shall amend/develop necessary Codes and Manuals to implement construction and maintenance of roads in an environmentally and friendly manner also put into place assessment methodologies to evaluate the environmental and disabled friendliness and safety of various types and classes of roads.

13. **Dedicated Road Maintenance Fund:** State Government shall provide funds on a sustainable and dependable basis for maintenance of State roads. Apart from the above sources of fund PWD may also explore various other modalities including performance based-PPP and Concession Agreements for BOT, BOOT.

Out of funds allocated under non-plan head, first priority shall be given to routine maintenance and second to periodical renewals. Special repair shall be given priority after periodical repair.

14. **Monitoring, Testing and Capacity Building.**

14.1 PWD shall utilize computerized road maintenance management and monitoring systems for continuous monitoring of road condition and maintenance requirements, implementation of road maintenance work and other related activities.

14.2 PWD may prescribe accepted procedure for testing and evaluation of various materials and technologies involved in road maintenance, quality testing of works in progress and finished work and as appropriate and may specify practices or set up necessary testing facilities for the same.

14.3 PWD shall enable capacity building of its engineers, staff and other human resources in modern technologies, project implementation, monitoring, supervision and quality and operational practices.

15. **Budgeting and Financial Resources:**

15.1 Based upon the data supporting the Road condition the annual renewal programme, to be included in ARMOP, will be drawn up by the PWD department well in advance of the implementation period. A schedule of the maintenance, operations to be taken up under the ARMOP should also be prepared. The ARMOP and the implementation schedule should be approved by the Government of Kerala and sanction of available financial resources will be made in a timely manner.

15.2 The budgeting for maintenance expenditure under the ARMOP will also be done well in advance by the Government of Kerala before the start of the relevant financial year along with allocation of resources to the different operations/components under the plan.

16 Miscellaneous

16.1 The PWD shall engage the CRRI, New Delhi as a Nodal Agency to render Technical support in the introduction of best practices in maintenance operations including capacity building.

16.2 In order to ensure quality in construction and timely completion, penal clauses in the contracts will be strictly enforced

16.3 PWD shall establish Multimedia call centres to ensure better services to the road users. They can register complaints if any regarding road construction/maintenance, for reddressal.

17. Monitoring of progress and review:

1. The Chief Engineer Road Maintenance, Kerala PWD shall be responsible for implementation of the ARMOP and he shall exercise all powers delegated to him by the Government in planning, Procurement, execution and monitoring of the works included in the ARMOP.

2 **Interpretation**: If any question arises relating to the implementation of these rules, the same shall be referred to the Government for its decision: which shall be final. The decision of the Government shall be implemented.

BRIDGE POLICY

Bridges are the essential structures to increase the interconnectivity of the main growth centres, townships, and places of tourism importance and pilgrim centres. The construction of bridges at various essential places are to be prioritised based on the importance and availability of resources. The existing procedure for selection of bridges for new construction is not based on the importance or priority.

The timely maintenance of bridges and culverts are not given due importance by the departmental officers. The PWD Manual made it mandatory that the Engineers in charge shall inspect the bridges periodically and submit inspection reports. Regular maintenance of bridges and culverts will ensure that the durability of such structures. The rehabilitation of the damaged bridges is possible.

A Bridge Inspection and Maintenance System (BIMS) is to be established in the department untiising the existing personnel by giving necessary training.. Modern technologies in Bridge construction are to be adopted in future. The responsibility of construction of Bridges shall be with the Chief Engineer (Roads & Bridges) and the maintenance of bridge shall be of the Chief Engineer (Roads Maintenance) A short note on the Bridge inspection and Maintenance System (BIMS) is as follows.

Bridge Inspection & Maintenance System (BIMS)

INTRODUCTION

Bridges and other structures provide vital links and routes of passage on a wide range of infrastructure networks, e.g. road, rail and water. They are valuable assets which cannot be built and forgotten. Asset as such, they must be managed in a manner that minimises risk to public safety and disruption to service. The fundamental frontline activity at the disposal of bridge owners to ensure their assets are safe for use and fit for purpose is inspection. Asset management practices need to be implemented by road controlling authorities to achieve target levels of service in the most cost-effective manner. The lack of any data base on bridges in the country has led to a situation where we are neither clear about the exact number and location of nor have we been able to maintain this asset in proper working condition. The inspection and maintenance programme allows the bridge

development strategies can be implemented. Poor condition of bridges hampers efficient transport and has also led to accidents and loss of lives on several occasions. The aim of BIMS is to fill this gap by preparing a data base of all bridges in the country and detailing their structural condition so that timely action can be taken to repair the structures or build new ones in their place. A **Bridge Inspection and Management system** or **BIMS** is a means for managing bridges throughout design, construction, operation and maintenance bridges. As funds available become tighter, road authorities around the world are facing challenges related to bridge management and the escalating maintenance requirements of large infrastructure assets. Bridge management systems help agencies to meet their objectives, such as building inventories and inspection databases, planning for maintenance, repair and rehabilitation interventions in a systematic way, optimizing the allocation of financial resources, and increasing the safety of bridge users. The Bridge Inspection and Maintenance System (BIMS) is a comprehensive inventory management system with the ability to process bridge inspection and component information for use in inspection management, maintenance programming, budget development, strategic planning, and life cycle planning so that the safety of the travelling public and the investment in bridge structures is optimized.

The major tasks in bridge management are: collection of **inventory data; inspection; assessment of condition and strength; repair, strengthening or replacement of components; and prioritizing the allocation of funds.** Defects requiring attention will develop during a bridge's life. It is important that the defects are identified at an early stage to ensure public safety, to protect the investment by extending the life of the structure and to minimize the cost of repairs. A BIMS is a means of managing bridge information to formulate maintenance programs within cost limitations. Efficient and effective procedures are required to ensure use of sound assessment techniques and use effective repair methods. Lack of any data base on bridges in the country has led to a situation where we are neither clear about the exact number and location of nor have we been able to maintain this asset in proper working condition. Poor condition of bridges hampers efficient transport and has also led to accidents and loss of lives on several occasions. An efficient BIMS

aims to fill this gap by preparing a data base of all bridges in the country and detailing their structural condition so that timely action can be taken to repair the structures or build new ones in their place.

Inventory data

First step in any management systems is to collect inventory data for the purpose of inspection and monitoring. In this stage an identification number should be assigned to each bridge as:

1) **State Identity Number**

Each bridge is assigned a unique identification number or **State Identity Number** based on the District, and whether it is situated in a National Highway, State Highway or in a district road.

2) **Bridge Location Number**

The precise location of the bridge in terms of latitude-longitude is collected through GPS and based on this each bridge is assigned a **Bridge Location Number.**

3) **Bridge Classification Number**

Engineering characteristics like the design, materials, type of bridge, its age, loading, traffic lane, length, width of carriage way etc are collected and are used to assign a **Bridge Classification Number** to the structure.

4) **Structural Rating Number**

Each bridge is assigned a **Structural Rating Number.** The rating is done for each component of the structure like integral and non integral deck, superstructure, substructure, bank and channel, structural evaluation, deck geometry, vertical clearance, waterway efficiency etc.

Based on this inventory BIMS will analyse data and identify bridges that need attention. Further inspection will be carried out wherever required to improve the operational availability of the structure, enhance its life and prioritize repair and rehabilitation work.

Reporting System

The bridge inspection and maintenance programme depends on its reporting system, as this is the

means by which items indentified in inspections are included in budgets and repair work is undertaken. The proper record –keeping enables the bridge inspection engineer to programme maintenance work, to assess structural adequacy and provide information for assessment of structural capacity, to monitor the progress of structural changes. The form of recording system should have bridge inventory, drawings and photos, file of inspection forms and remedial work details records and its cost etc. An overall programme for General and Detailed Inspections(2 yearly and 6-yearly intervals respectively) should be prepared. It is important to follow up the maintenance work to ensure that defects identified have been attended to. To ensure consistency in reporting, standard inspection procedures should be used, as this provides a check list when collecting data on site. Copies of completed reports, together with supplementary reports and photographs to identify defects, should be held on file to provide a continuous history of the condition of each bridge. The prime need for any BIMS operation is a complete accurate and up-to-date record of the bridge right from the stage of construction. For each bridge there must be two reports i.e. **i) Original bridge Report and ii) Inspection Report.**

Guidelines and Proforma for the reporting system are given in **IRC-SP-18 Manual for Highway Bridge maintenance Inspection**

Organisation

The first and foremost step in BIMS is the formation of an efficient team for monitoring the bridge inspection and maintenance programme. It is very important that the team of bridge Inspectors be competent and experienced because the efficiency of the entire BIMS will be based on their findings only. Ideally all inspection should be carried out by the same team to ensure consistency and enables comparisons with previous inspection and so that changes in the structure condition can be monitored and priorities for remedial work established. The team should have extensive experience in the inspection, construction, design or maintenance of bridges with technical knowledge and competency with respect to bridge structures and construction materials. They must have the ability to correctly identify and interpret the severity and nature of structural

and material defects, assess their criticality and make the appropriate recommendations with respect to required action. Frequent training should be given to all members of the inspection team for updating the new technologies in the field of construction and rehabilitation of bridges.

Feedback to Designers

Often designers are unaware of problems in the field so it is important that there is a transfer of information between inspectors, designers, and owners to ensure that sound techniques are promoted and poor experiences highlighted so that problems are not perpetuated. The bridge inspection team should ensure that inspection reports include comments on design performance where relevant, and should pass these comments to designers.

Economic Evaluation

Economic evaluation techniques can assist decision making on many aspects of bridge maintenance and rehabilitation and ensure the most cost-effective management strategy is adopted. Economic evaluation enables management to make more rational decisions about when to replace an old structure rather than persist with high-cost maintenance. It enables the comparison of number of rehabilitation options which restore the bridge to its original level of service and extend its life.

Each item in the bridge maintenance programme should be the most cost-effective response to the maintenance need identified in the inspection. Items should only be included in the programme if they will give a future saving that exceeds the cost of the item. It is fundamental to understand why the defect has developed and anticipate what future changes may be likely and how quickly they might develop. Only then can repair options be identified and their effectiveness assessed. Prioritise the bridge maintenance items by considering the factors like, condition of the component, risk to the public, importance of the component, importance of the bridge, cost consequences of delaying the maintenance etc.