

A STUDY ON REMAINING SERVICE LIFE OF RURAL ROADS

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ABSTRACT

Many important decisions are necessary in order to successfully provide and manage a pavement network. At the heart of this process is the prediction of needed future construction events. One approach to providing a single numeric on the condition of a pavement network is the use of pavement **remaining service life** (RSL). This technical collaboration with the National Rural Roads Development Agency is funded through the financing provided by the World Bank to the Rural Roads Project. Road construction work is well documented in India through an extensive library of technical guidelines, manuals and specifications. As such, the quality standards of road works are well detailed and resulting in high quality outputs reflecting the functional objectives of such guidelines. Road maintenance forms part of the works carried out to provide adequate transport infrastructure. From a technical point of view, there is no shortage of technical guidance on how the works should be carried out. The challenge seems to be more related to how maintenance should be organized and when it should be carried out. The technical aspects of road maintenance are addressed in several good publications guiding the provision of a functional rural road network in India.

INTRODUCTION:

Rural road maintenance in the Asia region. The term "rural roads" is often used imprecisely. Some countries use it to define all roads which are not national or secondary roads. Others lump together tertiary roads, which are part of the publicly owned network, with other local roads which are not included under the responsibility of the government. In this paper rural roads have been defined as all public owned roads whose primary purpose is to provide purpose is to provide direct access for rural village and communities to economic and social services. Since the early 1980s massive investments have been made in rural roads.

There were several reasons for this. In the first place it was a natural extension of investment into the lower parts of the road networks given the major investments that had been made in the national highways of most of the countries of the region. It was therefore a logical step to develop the whole of the road network. Underlying this was a belief that rural roads and the vehicles that traveled on them would provide the catalyst for increased economic activity in the rural areas.

It also responded to the change in development thinking towards a belief in the necessity to develop the rural areas so that agricultural production is stimulated and to ensure that jobs and livelihoods are created locally to limit the urban drift. The development of the rural road network was seen as, if not the prime mover in this, certainly an important facilitator. Indeed the justification for rural road

investments was, and to some extent still is, based on their effect on the rural economy. With the emphasis on rural development came a major investigation of the dynamics of the rural areas. This included an assessment of the role of rural transport in the economic and social activities of the rural population. It became clear from this work that rural transport involved much more than roads and motorized vehicles and that it had a major part to play in the social activities of the rural population. The increasing traffic intensity, high tire pressure, increasing axle loads etc are causing early signs of distress to bituminous pavements throughout the world. The deterioration of the paved roads in tropical and subtropical countries differs from those in the more temperate regions of the world.

This can be due to the harsh climatic conditions and sometimes due to the lack of good pavement materials and construction practices. Pavement performance can be defined as the ability of the road to meet the demands of traffic and environment during its design life.

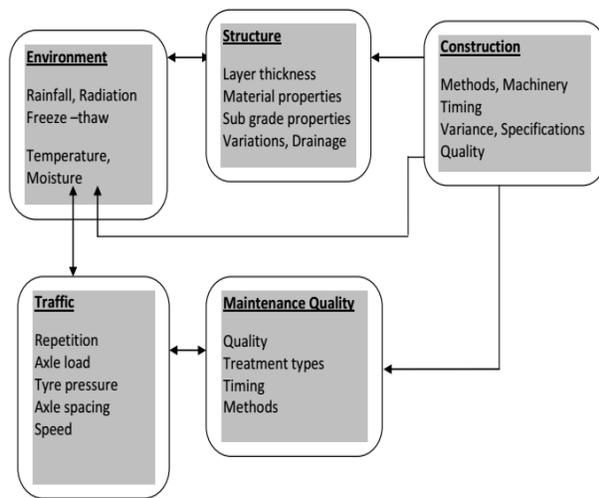
The reduction in the performance level of the pavement with time is termed as deterioration. Flexible pavements deteriorate due to many factors, predominantly traffic, climate, material, construction quality and time. These multiple parameters make the process very complex.

The condition of the road at any time can be predicted approximately using performance models. For managing the transport infrastructure system,

prediction and modeling of their performance are the main inputs as well as major challenges.

FLEXIBLE PAVEMENT DETERIORATION MECHANISM

The structural and functional conditions of flexible pavements changes with time due to continued effects of its structural adequacy, volume, composition and loading characteristics of traffic, environment, surrounding conditions and the maintenance inputs provided. The failure of the pavement occurs due to internal damage caused by traffic loads within an operational environment, over a period of time; and is not an abrupt phenomenon. Deterioration can also be defined as the process of accumulation of damage and the failure of the pavement is said to have reached at the limiting stage of serviceability level. Studies conducted all over the world have established that even though design and construction techniques vary from country to country, the deterioration pattern of pavements shows the same trend.



Understanding of Maintenance

The basic objective of road maintenance is implicit in the word itself. It is done to ensure that the road that has been constructed, or improved, is maintained to the extent possible in its original condition.

All roads require maintenance as they are subjected to traffic and the forces of weather. Even with the highest possible quality of construction, maintenance is essential to get optimum service from the road

structure during its life period. By applying preventive maintenance, the deterioration of the road and all its components can be slowed down and thus postpone the need for costly investments in rehabilitation.

Maintenance requirements depend upon a number of external factors such as traffic, terrain, soil types and climate. The need for maintenance is also very much determined by the original technical designs applied during the construction of the road, and the quality of the works carried out during the construction works. Depending on these parameters, it is possible to devise maintenance solutions and corresponding management systems which optimize maintenance costs and efforts.

Rural roads constitute the majority of roads in the national network in most countries. They normally cater for a limited volume of traffic, and therefore require relatively unsophisticated technical designs. However, due to their large numbers and wide geographical distribution, they create very distinct challenges to their management and operation.

Important part of an efficient maintenance programme. The prime objective when scheduling maintenance works is to ensure that the works are carried out as preventive measures, at an early stage when the road deterioration and damage are still limited. The works are therefore scheduled at strategic intervals when it is expected that the need for action is essential. For this reason, the timing of regular, or routine maintenance works are often related to the time of the year when rainfalls occur.

The most common work activities are:

- Erosion control on shoulders and slopes;
- Clear drains to allow free passage of water;
- Clear culverts and other waterways;
- Minor repairs to culverts and retaining structures;
- Repair and replace scour checks;
- Repair, fill and compact potholes and ruts;
- Grass and bush clearing;

- Repair road signs.

PAVEMENT PERFORMANCE MODELS IN THE INDIAN PERSPECTIVE

The most commonly used models are HDM- 4 and AASHTO performance models. The performance models that are developed for Indian perspective are briefly reviewed here to compare the same with the models developed in the present study. These are categorized under three groups, considering the attributes that are related. These are:

i. Distress Characteristics Based Models: These models predict the information on roughness, rut depth, raveling, potholes etc. being developed as a result of traffic factor and age.

ii. Pavement Performance Rating Models: These models define the performance of the pavement using certain arbitrary or weighted values. This value varies within a certain range. Different researchers have proposed various indices. These include PSI (Present Serviceability Index), PCI (Pavement Condition Index), PCR (Pavement Condition Rating), etc.

iii. Models Based on Environmental Factors: These models consider the effect of various environmental factors like temperature of soil, pavement layers and surroundings, freeze and thaw cycles, humidity and precipitation, movement of ground water, capillary water or surface water etc. on the performance of the pavements.

FAILURE OF RIGID PAVEMENTS

The defects apparent on rigid pavements may be due to deterioration of the concrete, restrained volume-change stresses, or overload evidenced by pumping and/or structural breaks.

The basic distress in concrete roads is formation of cracks. Uncontrolled transverse and longitudinal cracks that occur during concrete pavement construction are due to various reasons and full-depth repairs are the only solutions in most of the situations. Further, unfortunately some concrete pavements do not crack at the saw cuts and instead crack at unplanned locations. The common terms for these early cracks are “random cracks” or “uncontrolled cracks.” The reasons for uncontrolled cracks are due to factors like saw timing, saw cut

depth, weather & ambient conditions, conditions of base and sub base, quality of concrete, joint spacing, rapid evaporation of surface moisture and so on.

Concrete structure is an assembly of operating systems that experience temperature, air pressure and vapor pressure gradients. Seasonal and diurnal fluctuations in outdoor conditions provide variability and direction of the gradients and these operating conditions can aggravate or accelerate premature failure of the structures. Concrete roads are vulnerable to attacks from atmospheric agents

SITUATION ANALYSIS

Rural roads are a fundamental element in the provision of access in the rural areas. However, such access has to be sustained otherwise the benefits will be lost. To be able to make meaningful suggestions regarding the provision of effective maintenance it is necessary to have an understanding of the current situation. This chapter looks at the physical, institutional and financial issues related to rural road maintenance in the region.

The Road Network

Roads are considered to be crucial to economic and social development. It is surprising therefore that the data on roads in the region are not only difficult to find but also questionable regarding their veracity. Data on the national highways is relatively abundant, however the further one progresses down the network the more difficult it is to find reliable statistics. Rural roads form part of an overall network and they are dependent on the higher order roads to serve their purpose and vice versa. In the first place it is useful therefore to see rural roads in the overall context of the road networks of the region.

RESULTS AND ANALYSIS

Design: The problems related to road construction on black cotton soil is minimized in this work, the flow of work as follows

Sample collection- The sample of black cotton soil was collected from Amalapuram is a town, municipality and revenue division in East Godavari district in the state of Andhra Pradesh, India. It is 60 km from Greater Rajahmundry city. It is at the head of the Konaseema delta, the triangle formed by the waters of the Godavari. Various laboratory tests

carried out on soil to determine the properties of black cotton soil Tests after addition of wastes- Three wastes are used in this work foundry sand, rice husk ash and bagasse ash to improve the properties of black cotton soil at 0 to 60% proportions independently. These wastes are easily available in local area.

Optimum amount of stabilizer- Various test are carried out on mixes soil and industrial wastes. From the Soaked CBR tests optimum amount of stabilizer required is obtained

CONCLUSION

The single most important issue related to the provision of rural road maintenance is the lack of capacity at the decentralized levels. Only in rare cases has the devolution of responsibility been accompanied by the requisite capacity to shoulder that responsibility. Even if there was a political will, even if attitudes towards maintenance changed and even if finance was available, the implementation of effective maintenance would not be done unless the appropriate capacity existed.

There is a desperate demand to strengthen local government capacity to carry out maintenance. The capacity needs to be matched with resources and clear targets and performance standards against which the local technical agencies are evaluated.

There is a general perception that maintenance is an activity that needs to be done when things go wrong. This may be in part cultural. You go to the Doctor when you are sick; you mend your car when it breaks down.

For politicians the benefit may be in demonstrating that not only are they preserving assets but employing local people by doing so - and this at a very low cost. However it would be wrong to place the blame only on the politicians. The roads fraternity has to embrace the concept that maintenance expenditure, though relatively small, is more important to the nation than expenditure on new construction. This not only places maintenance in a more acceptable light but also provides the basis for lobbying for additional funds for maintenance. After all it is a national tragedy that a major national

asset, the rural road network is deteriorating at such a rate.

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