

Causes of Distresses Generated on Flexible Pavement at North Gujarat Region

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Abstract

In this paper flexible pavement failure is defined in terms of decreasing serviceability caused by development of cracks and ruts. Before going to the any techniques of the maintenance we must look into cause of failure of flexible pavement. Distresses generated in flexible pavement are caused due to the many reason and also combination of reason. Application of correction in the existing surface will increase the life of maintenance as well as strengthening layer. Also we visualize failure pattern are classified in existing pavement. Different factors are influencing the performance of flexible pavement is also identified. For efficient maintenance of road pavement, the deficiencies in our existing road system need to be clearly understood.

Keywords: - Distresses, Pavement, Causes of failure, Bituminous, Corrugations, Potholes.

INTRODUCTION

In developing countries have lost precious infrastructure worth billions of Rupees through deterioration of their roads. If their Government does not do much to prevent their roads, they will lose rupees more. Large road networks built great expense have been under maintained and more heavenly used and abused than expected.

By means of good transportation system safe, rapid, comfortable, convenient, communication for people becomes possible and which is essential for distribution of various developing countries that is the basic important for economical, industrial and environmental. For developing country good road network system is very important to gain the way

of modern society. If this continues, the deterioration of roads will increase rapidly as the old pavements crumble and the new ones outlive the initial period during which the effect of neglect are barely noticeable. Maintenance of the highway is very important for the whole traffic management. With poor maintenance system of the road various defects in the roads are main causes of Accident as well as increasing vehicle maintenance and vehicle operating cost.

In this paper on road defects in North Gujarat region the stretch between Unjha - Palnpur of around 45km indicates that the defects that most often cause injuries to road users, inadequate shoulders, uneven lanes, improperly marked signs, malfunctioning of stop lines, construction negligence and various authorities negligence. Legal framework and transportation management are the national aims in decreasing the road distresses.

CAUSES OF DISTRESSES IN FLEXIBLE PAVEMENT

- In adequate pavement thickness and unstable condition of subgrade layer.
- Lack of lateral support from shoulder.

- Poor drainage condition.
- Improper design of pavement with reference to camber.
- Improper mix design and lack of stability.
- Lack of bond between bituminous surface and underlying layer.
- Localized disintegration of material.
- Less bituminous content in localized area.
- Opening of road to traffic before repaired patch set properly.

LITERATURE REVIEW

Collop and cabon (1995) evaluated the potential of longitudinal surface cracking in asphalt pavement using different mathematical solution. From 2D plane strain elastic half-space solution, the author concluded that there is singularity in surface stress at both ends of the contact if a discontinuity in shear fraction is assumed. The authors concluded that shear traction between pavement and tire high local tension around the edge of the

contact patch, which may lead to surface longitudinal cracks.

Rushikesh, Dr.L.B.Zala and Dr.F.S.Umrigar (2011) examined condition at NH-8B (Section Rajkot-Bamnamore (km-185/0-km-216/8) dynamic nature of road pavements where elements of the pavement are constantly changing being added or removed and also gives an idea about problem of pavement deterioration and pavement condition at present.

Neero, Thangmuansang and Nungleppam (2014) examined 20 km length of NH-52A selected to carry out survey of pavement distress. In this study, the observation showed that the most commonly found pavement distresses in the highway were potholes, alligator cracks followed by releveling and edge failure. The most required probable treatments for surveyed distresses are overlay, patching and shoulder improvement. It was also observed that the side drainage was not good maintained, cleaned and even absent in some places.

Hanin and Dr. Tin (2014) examined improvement in pavement of Magway – Yangong Highway in order to provide a good pavement condition which vehicle

can operate effectively and safely. He was also classified failure and its pattern. He also selected case study in between mile (183/0 – 253/0). They also classified visual maintenance and structural maintenance. Structural maintenance, stress and deflection were classified by method of Soil Mechanics of Three Layered System. The required overlay thickness is evaluated according with IRC formula. According to evaluation, it is found that resurfacing and routine maintenance is required.

J Marees Kumar (2014) examined different factors affecting on flexible pavement cracking. He was also investigation carried by visual condition survey, excavation of test pits, coring pavement sample and asphalt mix design. They also examined several causes of Top-down cracks mechanism such as Load induced stresses and strains, Thermal stresses, quality/ hardening of the binder and Segregation in the Asphalt mix.

Surajo Wada (2016) examined pavement failure and problem. Failure of pavement caused due to combination of reason. Applying correction in the existing surface will increase life of maintenance work as well as strengthening of the pavement layer.

Sharad and Prof.A.K.Gupta examined pavement failure in terms of decreasing serviceability caused by development of cracks and ruts. They also considered three parameters unevenness index, pavement cracks and rutting. Also with the maintenance techniques there are various methods for pavement preservation which will help enhancing the life of pavement and delaying its failure.

Zulfiqar and Dr. Rakesh Gupta (2017) examined different types of cracks are generated in flexible pavement due to the water penetration also defects in flexible pavement is a problem of multiple dimensions, growth of traffic (in terms of no. of heavy loading vehicle), the rapid growth expansion in the road network, improper road technology, material, equipment, unskilled labor and finding problem have all added complexities to the problem in flexible pavement. Maintenance is set of activated directed towards keeping structure in a serviceable state during its design life. Maintenance of road network involves different types of operation like identification of deficiencies and planning, programming and scheduling for proper implementation in the site and supervising.

Tanuja, Manoranjan, Naveen and Palika (2018) examined develop models to predict deterioration of pavement distresses of urban road network. They develop five(5) model programme for the prediction of pavement distress: model 1 for cracking progression, model 2 for releveling progression, model 3 for the potholes progression, model 4 for the rutting progression and model 5 for roughness progression. They also selected case study of Patiala city, Punjab during the year between 2012-2015. Two fitness functions have been evaluated in the models, that is co-efficient of determination (R^2) and Root Mean Square Error and it is referred that GP model predict with high accuracy for pavement distress and help the decision makers for adequate and timely fund allocation for preservation of the urban road network.

Prashant and Dr. Sachin (2018) examined every type of its life span. It is expected to retain life span at all loading condition. But due to improper material, low quality supervision is road seen to be in good condition. They used PCI method for maintenance Technique.

PAVEMENT CONDITION SURVEY AT DIFFERENT REGION OF NORTH GUJARAT DURING RAINY SEASON GJ SH 41 OF AROUND 45KM

I visualize the highway between Unjha – Palanpur of State Highway 41. I observe various distresses are generated in the flexible pavement due to the various factor affecting on to the Road.

Table.1: Chart of Different types of Distresses at various Area

 Fig.3. Rutting on SH41 near ESSAR petrol pump Of 340m	 Fig.4. Corrugation around Bridge constrution on Chhapi Railway crossing
 Fig.5. Patching on SH 41 at Siddhput Kakoshi cross road	 Fig.6. Transverse Cracking At the joint of Rigid to the Flexible pavement
 Fig.7. Potholes near Chhapi Cross Road	 Fig.8. Edge bracking at diferent chainage on SH-41

FACTORS AFFECTING PERFORMANCE OF A PAVEMENT

Traffic Loads

Traffic is the most important factor influencing pavement performance. The performance of pavement is mostly influenced by the loading magnitude, configuration and the number of load repetition by heavy loaded vehicle. Thus a pavement is designed to withstand a certain number of standard axle load repetition that will result in certain road condition deterioration.

Construction Quality

Failure to obtain proper compaction, improper moisture content condition during construction, quality of material and layer thickness all directly affect the performance of pavement. The importance of good inspection and quality control procedure during at the time of pavement construction is required.

Moisture Content (Water)

Moisture can significantly weaken the support strength natural gravel materials especially subgrade. Moisture can enter the pavement structure through cracks and holes through surface, through the subgrade and from the under laying water table through capillary action. Loss of particle interlock and subsequent particle displacement results in the pavement failure.

Subgrade

The subgrade is the under laying soil that support applied wheel loads. If the subgrade is too weak to support the wheel loads, the pavement will flex excessively which ultimately causes pavement failure. If natural variation in the composition of the subgrade are not adequate addressed by the pavement design, significant differences in performance occur.

TYPES PAVEMENT DISTRESSES AND CAUSES

Table.2: Types of Distresses and its cause

Sr. No.	Types of Distress	Causes of Pavement Failure
1	Alligator (Fatigue) Cracking	• Poor base drainage • Improper pavement thickness • Poor construction • Excessive overloading
2	Edge Braking	• Inadequate edge support • Seepage and heavy rainfall

		• Improper alignment • Improper pavement width and Frost heave
3	Potholes	• Loss of surface course due to heavy rain • Moisture entry to base course through a cracked pavement • Poor bond between surface and base course layers • Less bitumen content in localized areas • Too thin bituminous surface
4	Longitudinal Cracking	• Displacement of joints at pavement widening • Differential settlement between cut and fill • Poor drainage and variation in Temperature
5	Rutting	• Unstable bituminous mixes • Unstable granular bases and sub bases • Inadequate compaction of structural layer • Heavy channelized traffic
6	Raveling	• Deterioration of binder and aggregate • Poor adhesion of bitumen binder to aggregate particle due to wet aggregate • Improper compaction
7	Transverse Cracking	• Shrinkage crack bituminous surfacing • Reflection of shrinkage crack • Joints and cracks in the pavement layer underneath
8	Bleeding	• Presence of excessive binder content in the pavement • Improperly applied seal coat
9	Patching	• Seepage of water through asphalt • To break bond between surface and lower layer • Inadequate cleaning • Opening of road before repaired patch set properly

CONCLUSION

After going through numbers of research and visualize observation I conclude that defects in flexible pavement is a problem since long time and there is a need of

identification of problem and rectifying it.

The research should have objective as:

- To identify type and classification of common distress in flexible pavement on SH-41 in between Unjha- Palanpur.
- Sudden increase in traffic loading especially on road where the design on lesser traffic is a major cause of cracking.
- Poor drainage condition especially during rainy season, force the water enter the pavement from the side as well as from the top surface.
- If the temperature of bituminous mixes is not maintained properly, then it also leads to pavement failure.
- The small distress must be repaired before any major maintenance is done. Even reduced thickness of overlay will show better result if minor defects are repaired before overlay are done.

- Insufficient funding often limits the timely repairs and rehabilitation of pavement. Better funding and management should be provided in order to keep the pavement good condition.

RECOMMENDATION

- Since frequently and interval of pavement distresses is too much and well exceeded the standard limits, immediate repairs and maintenance will required either overlay or resurfacing. All the material should be up to the standard recommended by IRC or MoRTH.
- By using proper maintenance management system we can predict future deterioration for the road network system and prepare preventive maintenance plan.

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