

# Sustainment of Flexible Pavement Failure and Its Remedial Measures

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**Abstract:** Investigation and repair on highway network system are major expenses in the state budget. Generally after the opening of newly constructed or maintained or newly widened roads which is very good in terms of level of service, but after some time due to increase of traffic volume and weather changing especially in monsoon season the road quality is decorated at every use of traffic after that the road gets completely decorated with uneven cracks, pot holes etc. Road failure is because of many factors, the four primary reason of road failure are failure in design, construction, maintenance, material used and geometry of the roads. For above mentioned reason various concerned organisation are pointing out the need for developing an intelligent, well and efficient road performance model that can prioritize pavement maintenance and rehabilitation work. With weak maintenance system of the road various defects in the roads are main causes of accident. Maintenance of a road network involves a variety of operations i.e. Identification of deficiencies and planning, programming and scheduling for actual implementation in the field and monitoring. The essential objective should be to keep the pavement in good condition and to extend the life of road assets to its design life. So to be a successful engineer, a person should not only able to design the road but also skillful to maintain the road

## 1. INTRODUCTION

**Flexible pavement:** It has been defined as a pavement that has an asphalt concrete surface having low or negligible flexural strength and are rather flexible in there structural action under the loads. Typical flexible pavement consist of four layer components:

- Soil subgrade
- Sub base course
- Base course
- Surface course

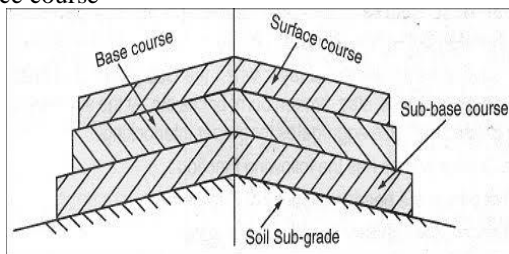


Fig.1: Flexible Pavement Structure

The main and major factors to be taken in consideration in the flexible pavement are

- Traffic volume
- Climate and weather conditions along the year
- The road geometric design
- Position
- Soil or subgrade
- Drainage

## TYPES OF FAILURES IN FLEXIBLE PAVEMENT AND REPAIR TECHNIQUES

### 1. Alligator cracking or map cracking:

Alligator cracks are also called as map cracking. This is a fatigue failure caused in the asphalt concrete. Alligator cracking is commonly found at intersections where vehicles are stopped for a continuous amount of time.



Fig.2: Alligator crack repair

### 2. Block cracking:

This is also called as thermal creaking. Reflection of joints cracking in underlying base. The cracking is happening in form of blocks. Low severity block cracking may be repaired by a thin wearing course. As the cracking increases overlays and recycling may be needed.



Fig.3: Block cracking

### 3. Longitudinal cracking and transverse cracking:

This distress can be considered as either a structural or an environmental distress. These are long cracks that run parallel to the center line of the roadway.

The transverse cracking is formed perpendicular to the pavement centerline and form at approximately right angles to the centerline of the roadway.



Transverse Cracking in Asphalt Flexible Pavement



Longitudinal Cracks in Asphalt Flexible Pavement

#### 4. Rutting:

Rutting is channeled depressions in an asphalt surface that form over time from exceeded weight limits and improper base construction. Rutting is usually a failure in one or more layers in the pavement. The width of the rut is a sign of which layer is failed.

Minor surface rutting can be filled with micro paving or paver placed surface treatment deeper ruts may be shimmed with a truing and levelling course, with an overlay placed over the shim. If the surface asphalt is unstable, recycling of the surface may be the best option.



Fig.4: Rutting

#### 5. Edge Cracks:

Edge cracks travel along the inside edge of a pavement surface within one or two feet. In unconfined asphalt pavement edge cracking is found to occur.

At low severity the cracks may be filled. As the severity gets more, patches and replacement of distressed areas may be needed.



Fig.5: Edge cracks

#### 6. Potholes:

These are small bowl-shaped holes formed on the surface of road. These are often located in poor drainage areas. Potholes are formed when the pavement disintegrates under traffic loading, due to inadequate strength in one or more layers of the pavement once a pothole is formed a patch can be applied to the destroyed area and to become compacted.



Fig.6: Potholes

#### 7. Revealing:

It is a result of insufficient adhesion between the asphalt cement and the aggregate. Once revealing occurs an asphalt surface will lose its impervious properties and will let water enter the surface.

The typical repair for this type of situation is to overlay the revealing asphalt with a new layer of fresh asphalt.



Fig.7: Revealing

#### 8. Bleeding:

Film of asphalt binder on the pavement surface or excess binder occurring on the surface treated pavement may create a shiny-glass like reflective appearance and affecting the visibility of the pavement and reducing skid resistance.

- Minor bleeding can often be corrected by applying coarse sand to blot up the excess asphalt binders.
- Major bleeding can be corrected by cutting off excess asphalt with a motor grader or removing it with a heater planer.



Fig.8: Bleeding

#### 9. Shoving:

A form of plastic movement that is seen in the form of wave is called as shoving distress.

The most common repair for these areas is to perform full depth repair.





Fig.9: Shoving

### 10. Pumping:

Seeping or ejection of water and fines from beneath the pavement through cracks.



Fig.10: Pumping

### 11. Slippage Cracks:

Slippage cracks are crescent shaped or horse shoe shaped cracks or tears in the pavement layer. It is caused by a lack of bonding between layers.

The most common repair for these issues are full depth asphalt replacement.



Fig.11: Slippage cracks

### CONCLUSION

Some causes of road cracks and deterioration and defects are due to poor construction quality, poor maintenance policy and poor supervision. So after various researches I conclude that defects in flexible pavement is a problem since long time and there is a need of identification of problems and rectifying them.

- The maintenance should be done in off peak hours or in odd hours so the traffic is least affected.
- There should not be any delay in maintenance.
- Patching must be done promptly and properly. It requires skill close supervision and good quality patching material.

### FUTURE SCOPE

- Using a reputable company and good quality of materials is the first step in getting a long-lasting pavement surface.
- Coating the pavement with an asphalt. The best course of action is to seal them.
- Control of surface water or infiltration is needed by providing adequate drainage.
- Use new concepts for design and good quality equipment.
- Funds required for proper and timely maintenance of road be provided to the organization concerned.

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