

Essay on pavement distress

[Experience](#), [Failure](#)



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Introduction

System of road network is needed for any developed country and it is a vital part for infrastructure development.

Main subjects of this study are pavement defects such as alligator cracking, bleedings and potholes. Such pavement distress as potholes and alligator cracking cause serious negative effects and decrease the lifespan of pavement. Additionally, the safety on road is questioned due to bleedings of pavement since the friction between car and pavement significantly decreases, meaning that the braking path increases. This study is concentrated on studying three main types of distresses, their influence on the roads and methods on how to solve problems connected with them. Two lane road was studied to imply the theoretical knowledge on practice and to better understand the damage caused by such distresses.

I. Types of Pavement Distress

Main types of pavement distress are block cracking, corrugation and shoving, patch failure, pot hole, fatigue cracking, edge cracks, slippage cracks, bleeding, grade depressions, upheaval and swell, raveling and weathering, reflection cracking, rutting, polished aggregate, and cracks on longitudinal and transverse axis of pavement and transverse streaking on surface.

- Block Cracking

Block cracking is the crack that usually split the section on pavement into different pieces, usually in rectangular form. What are the main causes? It

results from dried out mix with low absorptive functions, or when such mix is too dry. The problem is resolved by placing thin layer on the pavement.

B) Fatigue Cracking

Fatigue cracking is another type of pavement distress which has a form of alligator. The main causes for it are thin surface, not effective drainage system. Additionally, heavy loads on pavement result in fatigue cracking. In order to repair it full-depth patch is needed.

C) Longitudinal and Transverse Cracking

Longitudinal and transverse cracking are perpendicular to the pavement's centerline. High air temperature with temperature changes, exposure to solar radiation for long period of time, flaws of pavement constructions in the underlying layer. In order to prevent such pavement distress and/or repair it - drainage system should be in proper condition and cracks are needed to be sealed. Additionally, drainage ditches can help in preventing Longitudinal and transverse pavement distress.

D) Slippage Cracks

Such cracks are caused in pavement with structure being comprised of sand and low-strength mix. As a result there is poor bonding between pavement surface layer s and track coat. Full patch is needed to fix slippage cracks.

E) Edge Cracks

Edge cracks are common for the edge part of the road. They are caused mainly due to low lateral support with weak base. Additional factors that contribute to the development of Edge Cracks are improper/outdated drainage system, flora along the pavement's edges. It is fixed by removing

vegetation from edges and emulsified asphalt needs to be used to fill edge cracks.

F) Reflection Cracking

Reflection cracks that are caused by the movement of lower pavement layers: concrete and asphalt layer. The problem gets worse with heavy traffic. Seal is needed or such cracks must be filled with emulsified asphalt to repair the distress.

G) Grade depression

With time and heavy traffic some parts of pavement become displaced on to lower elevations comparing to other parts of road. This is caused due to heavy traffic and flaws in construction techniques, especially miscalculations of lower layers. In order to fix this problem surface patch with overlay is required.

H) Shoving and Corrugations

Next distress type is the displacement of HMA mixture. Incorrect asphalt grade, rounded or smooth aggregate asphalt mixtures as well as low air voids are the main causes of Shoving and Corrugations. Full depth patch is a must to repair this distress.

- Rutting

Design flaws with insufficient thickness of pavement layers alongside with weak asphalt mixtures are the main causes of Rutting type of pavement distress. It is fixed by thin surface patching.

F) Bleeding

The main causes for bleeding pavement distress are heavy traffic and thick tack coat. Also by placing too much asphalt in the pavement mixture as well as improper construction contributes to the development of bleeding cracks. Sandwich or chip seals are needed to fix the problem.

J) Upheaval and Swell

The primary causes of upheaval and swell are temperature differences and expansive soil. Full-depth patch is needed to fix the problem.

K) Weathering/Raveling

Weathering and raveling type of pavement distress that happens due to the disintegration of pavement surface layer. The main reason for this is the dislodgment of asphalt. Heavy traffic, liquid and low quality of asphalt mixture cause this dislodgment.

It is fixed by placing thin overlay of asphalt on the damaged section.

L) Patch Failure

Patch failure is mainly due to removal of addition of new pavement to the road, as a result of flaws connected with installation of it. In order to fix this issue the full depth patch must be replaced.

M) Polished Aggregate

Polished Aggregate is another road failure that comes from heavy traffic flows, as a result of them the pavement tends to be polished off. Presence of water and wind conditions contribute to further development of polished aggregate, therefore, the surface becomes vulnerable to erosion.

The condition of the road is significantly worsened due to the continuous process of polishing. In order to prevent this from happening special measures by Abu Dhabi officials were presented for eliminating such road failures. The overall maintenance and surface pavement surface repair works are the activities held by Abu Dhabi executives. Utilization of skid-resistant seals will be the next step in the work maintenance plan in order to obtain the adhesion gain.

Procedures on preventing the polishing do not differ to the global standards that are in use over the world. However, the main difference is the bituminous layer. The next step of preventing polishing aggregate are the steps on how to eliminate water and wind on the pavement distress site. New trees plantations alongside with gabion houses are used to prevent the further development of polishing aggregate problem. It is a serious issue that needs to be processed seriously since it might lead to road accidents with other negative effects.

N)Pot Hole

Pot hole is another common problem with pavement surface since it is caused by improper asphalt mixture and it contributes to further deterioration process of different pavement distress types. Loosen points in sub-grade level as well as base layer of pavement contribute to the development of pot holes. In order to resolve the problem with pot holes injection of asphalt along side with full-depth patching procedures are used.

O) Bleeding:

When the pavement is exposed to high temperatures for quite a long period of time another pavement distress occurs: bleeding. The upper layer of asphalt melts and it fills aggregate voids. As a direct consequence to this thin sticky layer is created which is shiny and glossy.

HMA mix where asphalt portion is excessive as well as insufficient air space for pavement to expand during hot periods of time – are also the reasons for bleeding. If bleeding is a minor one it can be easily fixed by the asphalt binder and coarse sand. When dealing with more serious bleedings the previously mentioned methods will not be of help. Excess amounts of asphalt must be removed.

P) Polished Aggregate

Polished Aggregate are those parts of pavement where the above cement layer (the asphalt binder) is polished into small aggregate particles. The main reason for that is heavy traffic that polishes away the aggregate. The proper fix for polished aggregate pavement distress is a fog seal.

Q) Transverse/Longitudinal Streaking

The main cause of Transverse and longitudinal streaking is the invalid technique of spraying, it is when aggregate is not spread correctly along the pavement surface. Additionally it could be of nozzle issues, improper temperature balance and pressure. In order to fix it the re-sealing of the surface alongside with adjustment of it is needed.

R) Loss of Aggregates on Surface Treatments

Loss of Aggregates on Surface happens to the high speed of traffic and it occurs when aggregation was just applied and there was not enough time after this procedure. Additionally, aggregate was not spread properly and due to weather conditions: it either could be too dusty or too wet when aggregate spreading procedure was conducted, as a result the asphalt was cooled down too much. In order to fix this problem hot coarse sand spreading on top of the damaged areas is required, shortly after this the rolling of mixture with pneumatic roller is needed.

S) Alligator:

The failure known as « Alligator » mostly occurs on the roads with huge traffic. The reason why the distress takes place is in the bad compaction of the base or if the water can not freely drain throughout the pavement. The pavement in such situation is often associated with alligator skin. When the surface layer is not supported well enough the crack takes place and the pavement needs to be repaired. This is primarily caused by the weak base of the pavement and inability to maintain the loads and the huge traffic. High temperatures and rainfalls contribute to the weakness of the base as well. Another reason of the « alligator skin » is poor adhesion with the asphalt. The base becomes more and more thick and as a result needs to be replaced in advance to prevent the total pavement damage. Once new asphalt surface is designed the pavement can easily manage with the loads.

II. Maintenance plan:

One-directed two-lane road is the one which was chosen in order to maintain the loads. The distress in such roads covers the both lines. The benefit is that

while one line of the road can be repaired, the other one can be still used for the cars' movement. Once the first line is done, the repair can take place on the other part according to the same procedure.

III. Local and international practice code of road maintenance:

According to the local procedures of pothole maintenance they are fixed by partial patching and full dept patching. In the first case only some layers of the pavement are sawed. And with full patching sawing of all layers takes place. New surface materials is used and laid on the sawed portion of pavement.

When injection patching is used it requires drilling of that portion of pavement where pothole is located. In the end the hole is filled with filling material. Additionally such procedure includes air blows to clean before the procedure and the aggregate turns out to seal all voids.

There are two methods for fixing potholes: temporary and permanent. When temporary method is chosen it means to fill the hole with filling material and compress it till the material fills all voids. However, this method is not commonly used. When permanent method is used – it involves the procedure of cutting patches around damaged portion of pavement and filling them later with bitumen bound mixture.

Therefore, the following method is close to partial and full depth filling. But the difference is that first methods involve the use of sub-base as well as surface material with only single homogenous material is used.

Finally, bleeding is fixed by using different seals including chip seals, sandwich and thin layers according to local procedures. Methods in Abu Dhabi are similar to the ones applied globally where course sand is used on

the asphalt layer. However, the removal of excessive portions of asphalt is not practiced in Abu Dhabi. Heavy trucks are the main reason of the pavement distress in the country. The most efficient solution that can reduce expenditures to the minimum level and provide with safe working conditions is the reconstruction of the roads in a completely new way so that they can adjust to any kind of the roads, especially the one with very high loads. The human nature is designed in the way that it cannot influence all another natural phenomenon, for example, the rainfall. Therefore the pavements construction processes should be developed in order for the free water. Drainage helps to minimize the repair costs and is of a crucial importance in those countries which face the frequent and long term rainfalls. As a result it is difficult to overestimate the role of the effective drainage system. This should be included in governmental budget aimed at pavement construction in the countries to prevent the disasters.

V Conclusion:

It is an open secret that engineering industry is facing a huge breakthrough nowadays and pavements are considered to be the most outstanding engineering's achievement throughout the years. Pavements contribute to the infrastructural development of the country, improve logistics and transportation conditions. Therefore governments tend to design various strategies of pavement construction in order to minimize the expenditures and distress' reasons. It is an obvious fact that pavement distresses are not always caused by the human the pavement distress can also be caused by

the nature factors, among which the leading role belongs to high temperatures or rainfalls. The important thing is that human actions which cause distress can be controlled and prevented in contrast to the natural ones.