

# Good general causes of pavement damage report example

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



## **Introduction**

This report will focus on failure damage on the road. It will take the given specifications from the director, and examine three different types of failure damage on a 300 meter stretch of pavement. The purpose of this project is to understand the road layers and the problems that may effect on each layer with different causes in each damaged selected location. This project also highlights the important role of creating study case and the advantage of making early fixing or maintenance to avoid the future unexpected damage on road. Moreover, this project's emphasis how weather condition has the major factor in negative impact of the internal road and external road through the expansion and shrinkage which lead to early failure damage.

This report will investigate the main parameters of this project to discuss the general causes of pavement damage and will describe the failure in detail with a sketch in each segment. It will also have investigated causes of each failure for this portion of road and will have list of alternative treatment used currently. In addition to that, this technical report will include the plan of development maintenance plan, will be compared with similar failure between Abu Dhabi and England. Finally, it will contain the procedure of maintenance and recommended solution for the problem area of pavement.

## **Chapter one**

The road network is very important for a good integrated transport system no matter what country. Road maintenance works are what keep these roads from becoming run down and falling into disrepair. However, even if the

upkeep is very good, pavement and asphalt can and will become distressed over time. When there is distress on the pavement, this presents a problem for people using the roads: their serviceability and availability are greatly decreased and they can cause accidents. The factors that cause pavement distress are varied, but weather and use are two of the most common ways that pavement can become distressed. Causes of pavement failure are the traffic uses, environment, improper design, poor maintenance and errors on construction practices.

## **Traffic**

The first factor of the pavement distress is the traffic load. Traffic load is a problem that develops over time as vehicles use the road and cause some damage to it. The excessive load that comes from the heavy vehicles can affect directly on the road and cause cracks. Also, the load repetition on the same road cause distress and cracks to the road, Time and repeated pressure of these vehicles the road may expose to rutting and surface cracks. Additionally, the drivers of these trucks often do not follow the rules of the traffic authority, since they don't use the trucks road, but they use the highway which is not designed for these conditions.

## **Environment**

Environment plays an important role in the road distress and damages. Aggressive weather can cost some countries millions in repairs to the road. Some countries have annual storms and huge amount of rain which also causes road damage. In the UAE, high temperature is the main challenge that faces the road system, since it considered as one of the main reasons of

the cracks and other types of damage. Also, the drainage system in the countries that have a high level of rain will affect directly on the road.

### **Improper design**

Thirdly, inadequate design of the road pavement in each layer could affect the surface and the sub base. These changes will make the thickness of the surface improper and will damage the structure layer of the pavement. In addition, if the design of constituent pavement goes wrongly will affect the factor of safety of using this road which result poor drainage and will damage the road pavement. Finally, there could be a capacity issue that could affect on road users when having unexpected load of traffic.

### **Lack of maintenance**

Finally, many road networks are facing the significant structural damage which results from the users of the road and the poor design of the pavement, which was often recommend for maintenance. If there were cracks on the surface, they often went uninvestigated, and they must be investigated to check the sealing. Road pavement could be corroded from the shoulder start and improve by itself after certain of time if shoulder of the road noticed is damaged must have maintained urgently and to repair it by expert company.

### **Poor construction and lack of quality control**

Finally, road pavement must not be created with substandard materials to avoid the future unexpected failure of layers and the sub base of the pavement. Quality of materials also can have a major effect on the

protection future damage of the road-- and this can be controlled by supervision. In addition to that the method of construction must be done carefully as procedure requires avoiding poor construction and the lack of quality control.

### **Alligator cracking**

The fatigue of asphalt is the failure pressure of concrete under the influence of repetitive loads. The failure area in this segment is a crack that is called an alligator crack which has the following measurements: 9m length and 2m width and depth 5 cm. The cracks begin beneath the surface of the asphalt where the stress and strain under high tensile frame, and then spread to the surface in the form of longitudinal cracks parallel. As a result of repetitive motion loads these cracks begin to communicate in all directions in the form of sharp corners composed of forms that look like alligator skin. The main reasons of damages are insufficient pavement and thickness, traffic loads too high for the design load, and poor drainage.

### **Longitudinal cracks**

Longitudinal cracks are cracks extending parallel to the axis of the road, and the occasional cracks it extends pavement width approximately perpendicular to the axis of the road. These cracks are structural defects (double layer pavement) and functional defects (surface roughness of the pavement), so they are defects that are not related to traffic loads, but loads and humidity accelerate the deterioration of these cracks.

## Chapter three

Investigate the causes of failure for this portion of road

Potholes

There are three general causes and effects on road to create potholes. These causes and effects are:

- 1- Breaks the surface layer as a result of cracks in the pavement.
- 2- Segregation localized to the surface of the pavement layer.
- 3- Presence of moisture and movement help to precipitate the potholes.

On the selected segment, there were several reasons that pothole failure occurred. The primary reasons for this failure are:

- 1- Lack of maintenance for the long term.
- 2- Traffic action on the road.
- 3- Water table is very high which effect on the surface and subgrade.
- 4- Poor quality of the materials used and because of neglect.
- 5- Surrounding effecting of distress
- 6- Not well compacted

Longitudinal crack

There are general causes and effects on the road to create the longitudinal cracks. These reasons include:

- 1- Poor implementation breaks the pavement.
- 2- Temperature difference.
- 3- A reflection of cracks from the bottom to the top.

On the selected segment there are several reasons why longitudinal cracks are occurring in the area. These reasons include:

- 1- Double the cohesion of paving materials in the areas of joints between the

pavements.

2- Aging pavement with time.

3- Expansion and shrinkage in the pavement as a result of temperature differences.

4- A reflection of the cracks of the old pavement layer upon layer of new pavement.

Patching

Possible reasons include a defect of patching in the selected segment which are:

1- Lack of quality control materials.

2- Poor implementation of re-filling and not welling run asphalt.

3- Surrounding failure road affect.

4- Unexpected load.

Alligator crack

There are a number of possible reasons for alligator cracks in the segment.

These reasons include:

1 - Insufficient pavement thickness.

2 - Increased traffic loads for the design loads.

3 - Creating layers on top of layers of asphalt paving is fixed.

## **Chapter four**

Alternative treatment used

In this case if the road reaches the status of road surface to the advanced stage of the severity of defects, particularly structural defects such as alligator cracks or rutting, etc. then the maintenance procedures required to

remove the upper surface of the existing pavement and re-construction. This process includes the following:

- Remove layers of the pavement, base layer and layer under foundation if damaged.
- Cutting asphalt and have leveling soil for machining or filling as required depth by process of maintenance.
- Full depth patch
- We have to check each layer; it must conform with the technical requirements
- After repair or replacement of layers of soil, we paint and sprayed base layer according to the specifications.
- Spill the base layer of asphalt as the specification
- Spray glue layer of asphalt
- Spill the surface layer of asphalt appropriate
- Marking and traffic signals required as specification

## **Pothole and patching**

Patching is the addition on the damaged surface or partial removal of the surface layer if affected, either by machining or by scratching to the appropriate depth. Some times by reusing asphalt concrete paving mixture can be done without removing the patching surface layer of existing asphalt. We have to be careful when we cut the edge of asphalt.

1. Remove the upper layers of asphalt
2. Replace layer of collapsed by new asphalt. It can be deep patching, in some cases, removal of all layers and re-create



### 3. Injection patching

#### Longitudinal crack

At this stage we have different style of treatment and fixing which depend on the situation of crack in each case-- the type depends on the distress and density. If density is low and the distress is high then a slurry seal is used, while in medium distress crack sealing is used. When distress is low, nothing is used. In the second stage which is in medium state of density as 11% to 55% with low distress nothing to do and in medium crack sealing must be implemented. In high density, slurry seals should be used. Finally in high density and high distress a thin overlay should be applied. In medium distress use crack sealing but in low nothing to do as the table shows.

## **Chapter five**

### Develop a maintenance rehabilitation plan

Based on the evaluation of the four factors listed above, it should be clear that prioritizing maintenance reduces the high level of risk on the damaged segment whenever the deterioration of the road is great. On this basis, each areas or sectors respectively from largest to smallest depending on the degree of the evaluation should be considered for repairs and maintenance. Finally, the list of repairs must be revised according to the list of priority before approving the final form, also must be taken under consideration the plan of budget and the safety plan in the following steps.

## **Chapter six**

### Compare and contrast with similar failures locally and international

#### International Road Maintenance Code

The code of international road maintenance it must be followed by rules and scientific application. To perform perfectly is important during maintenance road works. In addition to that, these rule are important--they are protecting many parties such as government, the client, and the contractor. This ensures that everyone gets to have high quality and durable road. It also gives right choice of materials for the road maintenance or to build new road and could use the code as references for engineers or contactor. The code of road maintenance is having all type of distress and shows the most proper way to repairing of fixing such as cracks, longitudinal crack, pothole and alligator cracks. At this stage there will be a comparison and contrast between two distresses as local and international treatment.

## **Compare and contrast**

### Pothole repair (Winter Patching)

Patching methods have various methods used followed in each country. In England and United States, which have low in temperatures mostly in winter time, a winter patching style which is most proper for low temperature is used. This type of method is preferred by most engineers-- it only helps when the snow or ice at the beginning of melting stage which helps engineers to avoid to use salt or other chemical materials. The disadvantage of using this method is that it cannot be used when there are high temperatures, especially in summer time. These temperatures will affect the sub base and the base of road from the result of thawing from high temperature which will reflect negatively to the surface pavement. The biggest advantage of the winter patching is during winter time the road is

shrinkage and mostly frozen in the very cold area which helps to carry more load and less damage.

### **Transverse- longitudinal Cracks (Filling)**

The maintenance of cracks has evolved-- there are a number of ways to fix the crack one of these ways are sealing and filling. For my selection road the most suitable method is filling at this stage of failure. Each step of this situation have different steps to be followed depend on the condition of road pavement and the cracks recorded. The method divided in five steps: the first step is to select the area which has cracks that's needed to be cut and shape it. Next, prepare the cutting area and to remove all derbies for better result. Thirdly, fill the cracks by using proper materials and make sure to have the filling level as required. Finally, use blotting system by sand or use special cover.

These steps could be used as optional and it is not popular method of filling longitudinal crack. Cutting method mostly used for countries that have constant temperature. Asphalt and silicon at this stage must kept uncovered to remain as the quality required, but if covered will have negative effects from the condition of the weather.

### **Chapter seven**

Recommended solution

This type of local road is new-- the type which is located in new residential area and the road has been damaged to the advanced failure level. In this stage, the recommended maintenance is relatively simple: re-maintenance the road from the sub base and make sure to have some of traffic sign such

as reduce speed, speed limit and make hump to manage the speed to protect the surface pavement. In addition to that we have to make annual supervision on the local road and specifically on the previously damaged segment and to make double check on the drainage system design with the edge of shoulder and to make sure to have a plan of development target. Implement road rules such as heavy trucks not allowed to carry more than the required load as the specification given from the international code. The following points will be highlighted to improve the future plan:

1. Prepare special road for heavy load truck
2. Apply fines specially for trucks in local areas
3. Find solution for high water table level
4. Fixing shoulder in early stages of disrepair
5. Make annual supervision on the damaged area
6. Choose proper company for maintenance
7. Chose expert contractor for maintenance
8. Change contractor in case of repetitive problems or road failure damage

## **Conclusion**

This report shows the basic process of conducting road condition survey on a single stretch of road. Also, I mentioned Distress condition on the road pavement in selecting area length is 300m local road in Mohamed bin Zayed city to make a case study on the damage section and to analyses the failure in each damage section. The result of the case study has been shows in details of each segment of failure damage with recommended solution and how to create a plan of maintenance and to understand the process with

respect of priority. The procedure of maintenance happen on the road damaged segment was the most important lesson gained from this study. In addition to that, the most important point is the safety issue which has been discussed as well and in each road pavement there is the factor of safety must be followed to have safe roads and to avoid the future damage.