Civil Engg. Road Maintenance 4th semester (Highway Engineering)

General Causes of road failures :— page-1

⇒ Defects in the quality of materials used.
⇒ Defects in construction method and quality control during construction.
⇒ Inadequate surface or subsurface drainage in the locality resulting in the stagnation of water in the subgrade or in any of the road layers.
⇒ Increase in the magnitude of wheel loads and the number of load repetitions due to increase in traffic volume.
⇒ Settlement of foundation of embankment of the fill material itself.
⇒ Environmental factors including heavy rainfall, soil erosion, high water table, snow fall, frost action, etc.

Classification of Maintenance Works :—

⇒ Routine maintenance / Repairs :- These include filling up of pot holes and patch repairs, maintenance of shoulders and the cross slope, up-keep of the road side drains and clearing choked culverts, maintenance of miscellaneous items like road signs, arboriculture, inspection bungalows, etc.
⇒ Periodic maintenance :— These include renewals of wearing course of pavement surface and preventive maintenance of various items.
⇒ Special repairs :- These include strengthening of pavement structure or overlay construction, reconstruction of pavement, widening of roads, repairs of damages caused by floods, providing additional safety measures like islands, signs etc.

Maintenance of Bituminous Road :—

Mainly the maintenance works of bituminous road consists of :

(1) Patch repair.

(2) Resurfacing.

Patch Repairs :—

⇒ Patch repairs are carried out on the damaged or improper road surface.

⇒ Pot holes may be formed in the surface layers due to defects in materials and construction.

Pot Holes and Repairs :—

⇒ The excavated patches are cleaned and painted with bituminous binders. A premixed material is then placed in the sections.

⇒ Generally, cutback or emulsion is used as binders.

⇒ Bituminous emulsions could be used even when the pavement surface and the aggregates are wet during monsoons.

⇒ The material so placed in the pot hole, is well compacted by ramming to avoid any ravelling.

⇒ The materials in pot holes are placed in layers of thickness of 6 cm or so.

Resurfacing :—

⇒ In the event when the pavement surface is totally worn out and developes a poor riding surface, it may be more economical to provide an additional surface course on the existing surface.

⇒ In case the pavement is of inadequate thickness due to increase in traffic loads and strengthening is necessary, then an overlay of adequate thickness should be designed and constructed.

Maintenance of Cement Concrete Roads:-

It may be stated here that very little maintenance such as maintenance of joints only is needed for cement concrete roads if they are well designed and constructed. Main defect in this type of road is formation of cracks. Various types of cracking have been explained below:

Treatment of Cracks:-

(i) Temperature cracks, which are ineffectually fine cracks or hair-cracks formed across the slab, in both a pair of transverse or longitudinal joints, dividing the slab length into two or more approximately equal parts due to the temperature stresses like the shrinkage stress, warping stress, etc in the slab.

(ii) structural cracks formed near the edge and corner regions of the slabs, due to combined wheel load and warping stresses in the slab.

⇒ The presence of fine cracks only as such are not harmful and do not call for immediate maintance.

⇒ Due to repeated application of heavy wheel loads and variations in temperature and moisture conditions the cracks formed

⇒ Once the surface water starts getting into the pavement and the subgrade through the widened cracks, progressive failure of the pavement is imminent.

⇒ The formation of structural cracks in cement concrete slabs should be viewed seriously and needs immediate attention, as these indicate possible beginning of pavement failure.

⇒ First the cause of the failure should be investigated. If the failure is confined to one or a few slab only at a particular location,

and in general there are no structural cracks in other slabs, the failure may be localised one due to some weak spot eg the subgrade or due to localised settlement of embankment or underground drainage problem.

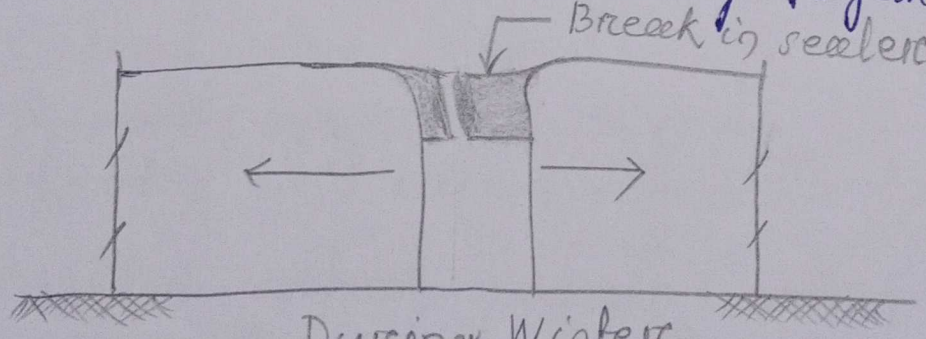
Maintenance of joints :—

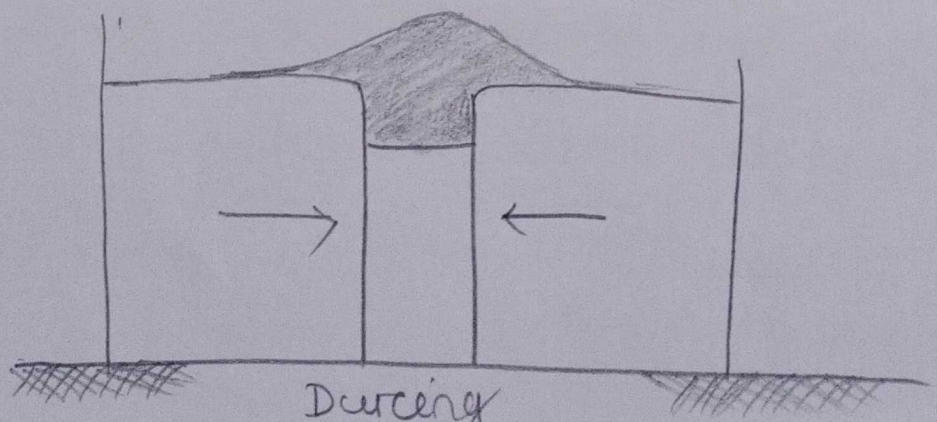
⇒ Joint are the weakest in cement concrete pavements. The efficiency of the pavement is determined by proper functioning of the joints.

⇒ Majority of the failure in the cement concrete pavements are observes after near the joints.

⇒ Therefore, utmost care is to be taken to see that the filler and sealer materials are intact at the joints.

⇒ During summer the joint sealer materials squeezed out of the expansion joints due to the expansion of the slabs; subsequently as the slabs contract during winter, the joint gap opens out and cracks are formed in the old sealer material. (see the following figure).





Road Shoulder Maintenance :—

The goal of shoulder maintenance is to restore the road shoulder to a condition where they capable of satisfying their main objectives, namely to;

(1) Provide a safe and smooth transition for road users who accidently leave or are forced to leave the sealed pavment area, and

(2) Protected the sealed pavement from excess deterioration such as edge breaks.

→ This may be achieved by either shoulder grading or shoulder resheeting or shoulder spot filling & grading depending on the amount of gravel available onsite.

Traffic :—

The study of traffic volume and traffic density is known as traffic capacity study.

Traffic control signal :—

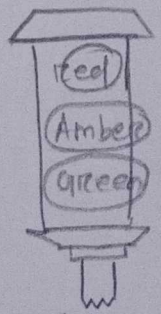
It is divided following catagories;

(A) Fixed time signal.

(B) Manually operated signal.

(C) traffic actuated signal.

The traffic control signals have 3 coloured light blows facing each direction of traffic flow. The red light is meant for stop, the green light indicates go GO and the yellow lights allow the clearance time for the vehicles which enter the intersection area by the end of green time.



stop

clearance time

GO

Traffic signal

⇒ Fixed time signal are set to repeat regularly a cycle of red, yellow & green lights.
⇒ The timing of each phase of cycle is predetermined based on the traffic studies & they are the simplest type of automatic traffic signals which are electrically operated.

Traffic actuated signals are those in which the timing of the phase & cycle are changed according to traffic demand.

Civil Engg Construction Equipments (Highway Engineering)

Hot mixing Plant :—

⇒ The Asphalt plants or asphalt plant is one plant that is used for mixing the dry warm aggregate, padding and ashphalt for homogeneous mixture at the required temp^t. It is widly used to construction of highway, City road and parking lot.

Tipper :—

Tipper trucks normally carrcy bulk materials such as sand, gravels, grain and even potatos. They are usually loaded from over head hopper. At the destination, the back of the truck is tipped to discharge the load. At the front hydrolic rams extend to raise the front of the body.

Tractor :—

⇒ A tractor is an engineering vehicle design to deliver a high tractive effort at slow speeds. *

⇒ It is most commonly used agriculture or construction work.

Bulldozer :—

⇒ A bolldozer is a machine mounted on the tracks with a large blade (metal plate) attached to it, allowing it to push large quantities of matter during construction, earthworks and quarrying projects.

Dumpers :—

⇒ A dumper is a vehicle designed for carrying bulk material, often on building sites.

⇒ Dumpers are distinguished from dump trucks by configuration: a dumper is usually an open 4-wheeled vehicle with the load skip in front of the driver, while a dump truck has its cab in

front of the load.
→ Dumpers with rubber tracks are used in special circumstances and provide a more even distribution of weight compared to tires.

Shovels :- It is a tool resembling a spade with a broad blade and typically upturned sides:- used for moving coal, earth snow or other materials except rock.

Graders :- A grader also commonly used in road of construction machine with a long blade used to create a flat surface during the grading proces.

Roller dragline :- It is a piece of heavy equipment used in civil engineering and surface mining.

It is broadly divided into 2 categories.

Smaller crane type :- used in civil engineering. these are used for road, port construction etc.

Larger crane type :- commonly used in strip mining operation to remove over burden above coal.

Asphalt mixer :-

It is a machine is used for laboratory mixing of bituminous materials to prepare the specimens to used for various Asphalt test.

eg. It is used in road construction laboratori

Tar boilers :- Tar boilers are widely used in highways constructions and development industry.

→ These are small sized and are easy to shift.

→ They are operated with electric motors and are capable of producing standardized quality produc it.

Road pavers :- It is a piece of construction equipmen used to lay asphalt on roads, bridges, parking lots and other such places.

→ It lays the asphalt flat and provides minor compaction before it is compacted by a rollers.