INFRASTRUCTURE - FAILURES IN RIGID PAVEMENTS

I INTRODUCTION

1.1 NEED FOR HIGHWAY MAINTENANCE

Road maintenance is one of the important components of the entire road system. The maintenance operations involve the assessment of road condition, diagnosis of problem and adopting the most appropriate maintenance steps. Even if the highways are well designed and constructed, they may require maintenance; the extent of which will depend on several factors including the pavement type. Various types of failures in pavements ranging from minor and localized failure to major and general failures do take place on roads. The failures may be due to one or a combination of several causes.

1.2 GENERAL CAUSES OF PAVEMENT FAILURES

Some of the general causes of pavement failures needing maintenance measures may be classified as given below;

- 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 pavement 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

1.3 CLASSIFICATION OF MAINTENANCE WORK

The various items of highway maintenance works may he broadly classified under three heads:

 Routine maintenance-repairs :These include tilling up of pot holes and patch repairs, maintenance of shoulders and the cross slope, upkeep of the road side drains and clearing choked culverts, maintenance of miscellaneous items like road signs, arboriculture, inspection bungalows, etc.

RAHUL N. SOMPURA (2905), SCHOOL OF BUILDING SCIENCE & TECHNOLOGY, CEPT UNIVERSITY, AHMEDABAD

INFRASTRUCTURE - FAILURES IN RIGID PAVEMENTS

- 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.

2 FAILURES IN RIGID PAVEMENTS

The cement concrete pavements may develop cracks and deteriorate due to repeated loads and fatigue effects. A rigid pavement failure is observed by the development of structural crack of break resulting in progressive subsidence of some portions of pavement. Moderate irregularities in the supporting layers beneath the cement concrete pavements are sustained due to inherent bending strength of these pavements. Rigid pavements are therefore capable of withstanding slight variations in the underlying support and they bridge the localized gaps moderately. It is the combination of many factors that induce the failure conditions in the rigid pavement. Due to the temperature effects, the newly constructed cement concrete pavements may also crack even if no vehicle moves on them. Often failure of rigid pavements starts from joints, corners and edges of slabs. Failures of cement concrete pavements are recognized mainly by the formation of structural cracking. The failures are mainly due to two factors:

- Deficiency of pavement materials
- Structural inadequacy of the pavement system.

2.1 DEFICIENCY OF PAVEMENT MATERIALS

Following are the chief causes which would give rise to the different defects or failures of cement concrete pavement:

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- Soft aggregates
- Poor workmanship in joint construction
- Poor joint filler and sealer material
- Poor Surface finish
- Improper and insufficient curing

The various defects that creep in due to the above are:

- Disintegration of cement concrete
- Formation of cracking

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INFRASTRUCTURE - FAILURES IN RIGID PAVEMENTS

- Spalling of joints
- Poor riding surface
- Slippery surface
- Formation of shrinkage cracks
- Ingress of surface water and further progressive failures

2.2 STRUCTURAL INADEQUACY OF PAVEMENT SYSTEM

Inadequate subgrade support pavement thickness would be a major cause of developing structural cracking in pavements. Following are the causes and types of failure which develop:

- Inadequate pavement thickness
- Inadequate subgrade support and poor subgrade soil
- Incorrect spacing of joints

Above would give rise to the failures of the following types:

- Cracking of slab comers
- Cracking of pavements longitudinally.

- Settlement of slabs
- Widening of joints
- Mud pumping

3 TYPICAL RIGID PAVEMENT FAILURES

Following are some typical and basic types of failures in rigid pavements which are dealt here in detail:

- Scaling of cement concrete
- Shrinkage cracks
- Spalling of joints
- Warping cracks
- Mud pumping
- Structural cracks

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