IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)
e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 15, Issue 2 Ver. II (Mar. - Apr. 2018), PP 43-47
www.iosrjournals.org

Road Defects and Highway Maintenance

Shaikh Sameer J., Mr. Kanahya Bhutada, Mr. Sainath Poharkar,
Mr. Devidas Chavade, Mr. Kedarnath
Engineering Department, Mgm's Polytechnic College, Aurangabad, India
Corresponding Author: Shaikh Sameer J

Abstract: *This paper summarizes the ongoing researches about the defects in Flexible and Rigid pavement and the maintenance in Flexible and Rigid pavements. In the past, lots of researchers have already studied the defects and problems of maintaining the Flexible and Rigid pavements all over the world. Efforts have been made to refer some of the publications related to this topic. Various defects in Flexible and Rigid pavements have been identified since the existence of Flexible and Rigid pavement. Pavement structure can be destroyed in a single season due to water penetration .Defects in Flexible and Rigid pavements is a problem of multiple dimensions, phenomenal growth of vehicular traffic (in terms of no. of axle loading of commercial vehicles), the rapid expansion in the road network, non-availability of suitable technology, material, equipment, skilled labor and poor funds allocation have all added complexities to the problem Flexible and Rigid pavements. Maintenance is set of activities directed towards keeping a structure in a serviceable state during its design life, 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 road surface and appurtenances in good condition and to extend the life of the road assets to its design life. Broadly, the activities include identification of defects and the possible cause there off, determination of appropriate remedial measures; implement these in the field and monitoring of the results.*

Keywords: *Defects, Flexible and Rigid Pavement, Maintenance, Road, Rutting, Paved Roads.*

Date of Submission: 15-03-2018 Date of acceptance: 29-03-2018

I. Introduction

A road network system is perhaps one of the most important necessities for the economic development of any country, particularly developing countries. Many of developing countries, therefore, invest huge amount on road construction, while many developing countries appreciate the necessity for huge investment in capital development of roads. Only a few give due importance to the road maintenance. It is found more glamorous to embark on new construction than to maintain what is already in existence. But unfortunately pavement structure can be destroyed in a single season due to water penetration. Maintenance activities may be required at intervals throughout the year, but their frequency varies with traffic, topography and climatic conditions, type of roads, grading and repairing pot holes and ruts for paved roads. They include repairing pot holes, surface patching, sealing of cracks and road surface marking. Transportation contributes to the economic, industrial, social and cultural development of any country.

II. Figures and Tables

1. Highway Maintenance Types and Activities:-

Type of Maintenance	Pavement Type	Activities
Preventive (periodic)	Flexible	Rejuvenation Mill and replacement of surfacing
	Rigid	Reinstatement of load transfer Under sealing Pressure relief joints Provision of edge support Retro fit drains
	Unpaved	Regraveling Regraveling of shoulders Road marking
Remedial (routine, recurrent, reactive)		Road sign repair and replacement Safety repair and replacement Drainage (subsurface, chutes, channels, batter drains, lined catch-drains) clearing and repair Grass-cutting and pruning of vegetation

		Mending of fences Removal of litter Winter maintenance (preventative salting, salting and
	Flexible	Resurfacing (with surface dressings, slurry, thin asphalt, micro thin asphalt, etc.) Patching (flexible) Crack sealing (flexible)
	Rigid	Full depth patching (rigid)a Partial depth patching (spalling repair) Joint and crack sealing (rigid) Slab jacking Under sealing Retexturing (grinding, grooving, cold milling) Recementation of cracks
	Unpaved	Gravel and repair Blading Spot regraveling Bridge and culvert repair
Emergency (urgent)		Cleaning of spillages Replacement of damaged guard-rails and road signs at critical positions Repair of washouts, rock or earth slides Removal of dead animals, trees, etc. Clearing of accident sites

2. Defects And Its Measure:-

Defect	Appropriate Maintenance Action	
	Preventative	Remedial
Surface cracking	Rejuvenation, resurfacing	Mill and replace (if severe)
Fatigue cracking	Resurfacing	Mill and replace
Longitudinal or transverse cracks		Crack sealing
Block or stabilization cracks	Resurfacing	Mill and replace crack sealing (if widely spaced)
Potholes (patch deterioration)		Patching
Rutting and shoving	Resurfacing	Rut filling mill and replace
Polished aggregate raveling and weathering	Resurfacing	Mill and replace
Poor binder condition	Rejuvenation, resurfacing	
Edge breaks		Patching of the edges
Lane-to-shoulder drop-off (unpaved shoulders)	Shoulder blading	Shoulder reconstruction
Roughness	Resurfacing	

3. Table for Physical and Financial Achievement of Road:-

Name of Division: -											
Name of Sub-Division: -											
Name of Road	Job No.	Sanctioned Length (km)	Sanctioned Amount (Rs. lakh)	Achievement upto previous Financial Year		Target for current Financial Year		Achievement during the year upto previous quarter		Achievement during the quarter	
				Physical (km)	Financial (Rs. lakh)	Physical (km)	Financial (Rs. lakh)	Physical (km)	Financial (Rs. lakh)	Physical (km)	Financial (Rs. lakh)
1	2	3	4	5	6	7	8	9	10	11	12

Cumulative Achievement during the year		Overall upto date Achievement		Likely date of Completion	Remarks
Physical (km)	Financial (Rs. lakh)	Physical (km)	Financial (Rs. lakh)		
13	14	15	16	17	18

4. Table for deciding Severity of Road:-

Defect Type and Description	Unit of Measure	Defined Severity Level		
		Low	Moderate	High
Fatigue cracking. A series of interconnected cracks in a chicken-wire or alligator pattern in areas subject to traffic loading	Square meters	An area of cracks with no or only a few connecting cracks; cracks are not spalled or sealed; pumping is not evident	An area of interconnected cracks forming a complete pattern; cracks may be slightly spalled; cracks may be sealed; pumping is not evident	An area of moderately or severely spalled interconnected cracks forming a complete pattern; pieces may move when subjected to traffic; cracks may be sealed; pumping may be evident
Block cracking. A pattern of approximately rectangular cracks from 0.1 to 10 m^2 in size	Square meters	Cracks with a mean width ≤ 6 mm or sealed cracks with sealant material in good condition and with a width that cannot be determined	Cracks with a mean width > 6 mm and ≤ 19 mm or any crack with a mean width ≤ 19 mm and adjacent low severity random cracking	Cracks with a mean width > 19 mm or any crack with a mean width ≤ 19 mm and adjacent moderate to high severity random cracking
Edge cracking. Crescent shaped or fairly continuous cracks which encroach on the pavement edge	Meters	Cracks with no breakup or loss of material	Cracks with some breakup and loss of material for up to 10% of the length of the affected portion of the pavement	Cracks with considerable breakup and loss of material for more than 10% of the length of the affected portion of the pavement
Longitudinal cracking. Cracks predominantly parallel to the pavement centerline, in or outside the wheel-path	Meters, and position (wheel-path, non-wheel-path) longitudinal)	A crack with a mean width ≤ 6 mm or a sealed crack with sealant material in good condition and with a width that cannot be determined	Any crack with a mean width > 6 mm and ≤ 19 mm or any crack with a mean width ≤ 19 mm and adjacent low severity random cracking	Any crack with a mean width > 19 mm or any crack with a mean width ≤ 19 mm and adjacent moderate to high severity random cracking
Transverse cracking. Cracks predominantly perpendicular to the pavement centerline	Number and meters	An unsealed crack with a mean width ≤ 6 mm or a sealed crack with sealant material in good condition and with a width than cannot be determined	Any crack with a mean width > 6 mm and ≤ 19 mm or any crack with a mean width ≤ 19 mm; and adjacent low severity random cracking	Any crack with a mean width > 19 mm or any crack with a mean width ≤ 19 mm and adjacent moderate to high severity random cracking

III. Performance Analysis

For the better understanding of Road Defects and its maintenance we were seen the actual defects on road as we studied with the help of books and reference papers. And also divide them as their type of defect. We also analyse the defects and knowing their severity. We were also measured the size of defects. And also study defects in traffic sign and road sign. We were observed and measured the defects on Jalgaon Road, Bajarang Chowk Road, Siddharth Chowk Road and T.V. Centre Road, Aurangabad, Maharashtra, India.

Fig.1 Longitudinal Crack

Fig.2 Pothole

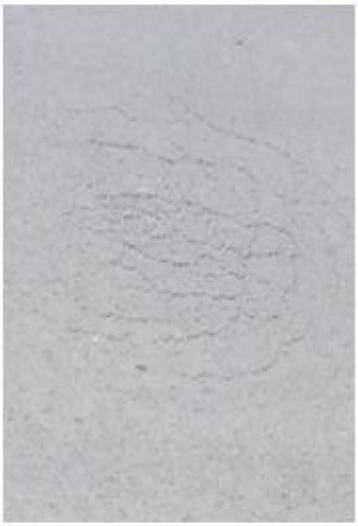

Fig.3 Fatigue Cracking

Fig.4 Block Cracking

Fig.5 Delaminationn

Fig.6 Swelling

Table No.1: Showing the Measurements of Defects at Central Naka to Seven Hills Road

Name of Road :- Central Naka To Seven Hills Road (800m)					
Pavement Type :- Bituminous Pavement					
Type of Work :- Maintenance Work					
Sr.No.	Type of Defect	Length (cm)	Width (cm)	Depth(cm)	Action Required
1	Rutting	319	31	1.4	Patchwork
2	Pothole-1	Diameter= 29cm		0.9cm	Patchwork
3	Pothole-2	Diameter= 82cm		3.2	Patchwork
4	Longitudinal Crack-1	283	-	-	Sealing
5	Longitudinal Crack-2	333	-	-	Sealing
6	Longitudinal Crack-3	488	-	-	Sealing
7	Raveling	300	470	-	Patchwork
8	Side Erosion	Along the Length of Road			Reconstruction of edges

Table No.2: Showing the Measurements of Defects at Siddarth Chowk N-6, CIDCO

Name of Road :- Siddarth Chock Cidco N6					
Pavement Type :- Bituminous Pavement					
Type of Work :- Maintenance Work					
Sr.No.	Type of Defect	Length (cm)	Width (cm)	Depth(cm)	Action Required
1	Rutting	423	24	0.6	Patchwork
2	Pothole-1	Diameter= 29cm		0.9cm	Patchwork
3	Pothole-2	Diameter= 82cm		3.2	Patchwork
4	Pothole-3	Dimension=52cm		2.1	Patchwork
5	Net Formation	542	279	-	Patchwork
6	Net Formation	488	345	-	Patchwork
7	Raveling	231	625	-	Patchwork
8	Side Erosion	Along the Length (654Cm)			Reconstruction of edges

Table No.3: Showing the Measurements of Defects at Bajarang Chowk N-7, CIDCO

Name of Road :- Bajarang Chock N-7 Cidco					
Pavement Type :- Bituminous Pavement					
Type of Work :- Maintenance Work					
Sr.No.	Type of Defect	Length (cm)	Width (cm)	Depth(cm)	Action Required
1	Rutting	437	76	0.9	Patchwork
2	Pothole-1	Diameter= 45cm		0.65cm	Patchwork
3	Pothole-2	Diameter= 76cm		15cm	Patchwork
4	Deformation	675	209	6cm	Patchwork
5	Deformation	435	321	4cm	Patchwork
6	Fatigue	234	324	-	Patchwork
7	Raveling	205	105	-	Patchwork

IV. Discussion and Result

Above tables shows the measurement that we were measured on Central Naka Road, Siddarth Chowk Road and Bajarang Chowk Road, Aurangabad, Maharashtra, India. Table No.1 shows the defects and their dimensions on Central Naka to Seven Hills Road (800m) which is need to maintain before it get high severity of

damage. Table No.2 shows the defects and their measurements in Siddarth Chowk Road N-6, CIDCO which has high severity and the road is needed to maintain quickly. Table No.3 shows the defects and their measurements in Bajarang Chowk Road N-7, CIDCO which has high severity and the road is needs special attention.

V. Conclusion

After going through number of researches we conclude that defects in flexible and rigid pavement are a problem since long time and there is a need of identification of problems and rectifying them. Thus it is concluded that a research needs to be done so as to see the various alternatives which can be adopted.

Acknowledgement

This work is supported by the Prof. Shaikh Sameer J. and the MGM's Polytechnic College, Aurangabad.

References

[1] Al-Mustansiryah University, Faculty of Engineering, Department of Highways and Transportation Engineering, "Highway Maintenance Course" (2015-2016).
[2] T. F. Fwa, "The Handbook of Highway Maintenance" By Taylor and Francis Group(2006).
[3] NRRDA's (National Rural Road Development Agency) guidance notes of "Managing Maintenance of Rural Roads" (October 2014)
[4] Zulufqar Bin Rashid, Dr. Rakesh Gupta "Review Paper On Defects in Flexible Pavement and its Maintenance", Associate Professor and Director, Civil Engineering department, SRMIET, Bhurewala, Haryana, India.
[5] Bureau of Indian affairs Division of transportation "BIA transportation facilities Maintenance handbook"
[6] IRC (Indian Road Congress) "IRC: 82-1982", "Code of Practice for Maintenance of Bituminous Surfaces of Highways" (January-1982).
[7] Dar-Hao Chen and Cindy Estakhri's "Material, Design, Construction, Maintenance and Testing of Pavement".
[8] Avinash Gupta's "Highway Construction and Maintenance".
[9] Robert A. Douglas's "Low Volume Road Engineering: Design, Construction and Maintenance".
[10] "Road Maintenance Techniques" by Jim Campbell, Chief Engineer, Cold-chon.

Shaikh Sameer J "Road Defects and Highway Maintenance." IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) , vol. 15, no. 2, 2018, pp. 43-47