Functional Evaluation of Flexible Pavement

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Abstract- *Road maintenance is one of the important components of the entire road system. The maintenance operations involve the assessment of road condition, diagnosis of the problem and adopting the most appropriate maintenance steps. Functional Evaluation of highways is primarily concerned with the ride quality or surface texture of a highway section. Smoother roads are required because they provide comfort and safety to road user, reduce vehicle operation cost by reducing fuel and oil consumption, tire wear, maintenance cost. Distress survey should be carried out to identify the presence of different distresses like potholes, raveling, rutting, edge cracks etc in the pavement surface. The functional condition of the pavement is rated to be good, fair or poor as per ASTMD-6433-11 and remedial measures are proposed. The evaluated results of the project will provide construction industry with an economical yet effective method of maintenance of pavements. This results in contribution towards passenger comfort and safety.*

Keywords- Pavement Condition Index (P.C.I), Functional Evaluation, Distress.

I. INTRODUCTION

Pavements deteriorate with age and traffic loading. Evaluation in service pavements is very vital for keeping them in good condition. To get a complete idea of the existing condition of any pavement, both functional and structural evaluation is necessary.

Functional evaluation of a few pavements is carried out, the details of which are given in the methodology of the section of this article. Before starting the review of available literature was made. Evaluation of six roads namely Krishna Gardens Road, RV Architecture College Road, KSIT Road, Nadaprabhu Kempegowda Road, Sweet Homes Road, Shivapuri Swamiji Road located in Rajarajeshwri Nagar, Bengaluru-560060 was carried out.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Methodology: The study locations are identified, Manual distress survey is conducted to identify the presence of various distresses like rutting, raveling, shoving, potholes, cracking, edge cracking, patching, etc. in the pavement surface. As per ASTM D6433-11, the percentage area of each distress present in each of the inspected sample units or roads are calculated. The severity of distresses are determined. The deduct values are determined from the deduct value curves for each distress type and severity. A total deduct value (TDV) is computed by summing all individual deduct values. Once the TDV is computed, the corrected deduct value (CDV) can be determined from the correction curves (graph 2). And the Pavement Condition Index (PCI) is computed by a relation PCI = 100 – CDV. Based on the PCI value the Roads are rated to be good, fair, poor, very poor, and serious, based on the rating the remedial measures can be assessed for increasing the life of in service pavements.

Severity level for potholes, edge cracking, Alligator cracks and rutting can be calculated as per ASTM D6433-11. Using the severity levels and density percentage, the deduct values can be calculated using graphs below.
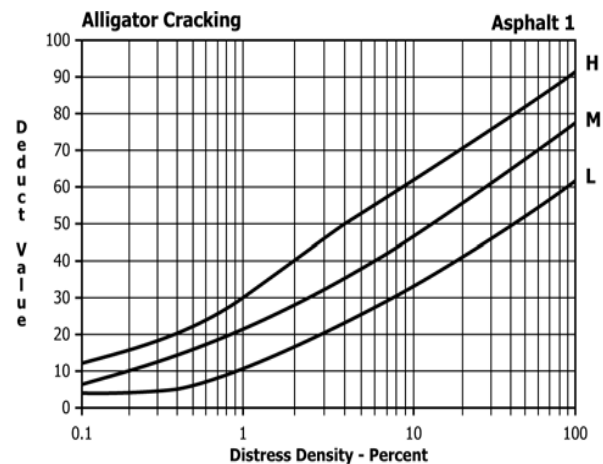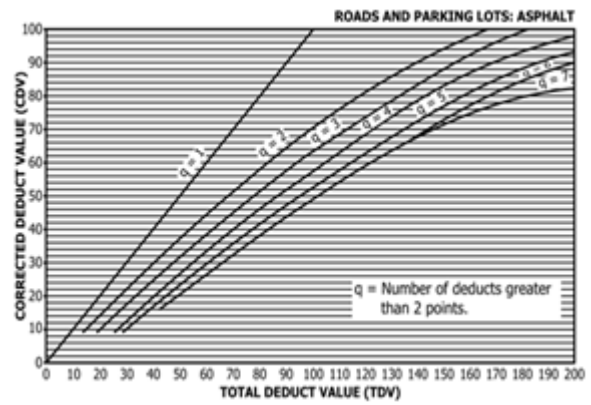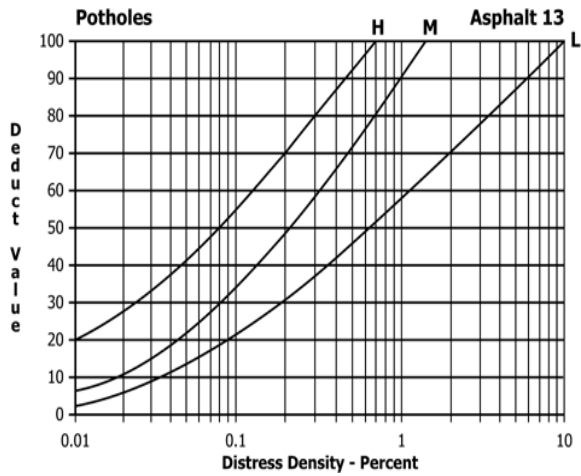
Now PCI can be calculated by a relation,
PCI = 100 – CDV.

III. SURVEY DATA AND CALCULATION

(Table:1)

Sl. No	Name of the road	Type & Quantity of distress	
		Type	Quantity (sq.m)
1	Krishna garden road	Potholes	4.16
		cracks	6.21
2	KSIT Road	Potholes	462.47
		Alligator cracks	89
3	RV Architechture College Road	Potholes	56.01
		Edge cracking	23.5
		Alligator cracks	12
4	Nadaprabhu Kempegowda Road	Potholes	79.6
		Alligator cracks	7.4
		Rutting	7.5
5	Sweet Homes Road	Potholes	166.7
		Edge cracking	58.9
		Alligator cracks	10.7
		Raveling	1.7
6	Shivapuri Swamiji Road	Potholes	527.57
		Edge cracking	835.95
			8

Using the severity levels and density percentage, the deduct values can be calculated using graphs below.

Once the deduct values are calculated by above curves, the deduct values of all the distress types are summed to form TDV. Using TDV and q value (number of deduct values greater than 2 = q value) the corrected deduct value can be calculated using the below curve.

Table: 2 Calculation of severity, density and deduct values of each distress type.

Sl No	Name of the road	Type of distress	Severity of distress	Density = quantity of distress(sq.m)/total area of the sample road (sq.m)	Density(%)
1	Krishna garden road	Potholes	H	4.16/9130	0.04
		cracks	H	6.21/9130	0.06
2	KSIT Road	Potholes	H	462.47/4000	11.56
		Alligator cracks	M	89/4000	2.25
3	RV Architecture College Road	Potholes	H	56.01/7000	0.8
		Edge cracking	M	23.57/7000	0.33
		Alligator cracks	L	D=00	0.17
4	Nadagabhu Kempegowda Road	Potholes	H	79.61/10000	0.79
		Alligator cracks	M	7.41/10000	0.074
		Rutting	L	7.51/10000	0.075
5	Sweet Homes Road	Potholes	H	166.7/5656	2.94
		Edge cracking	L	58.59/5656	1.03
		Alligator cracks	L	10.7/5656	0.18
		Ravelling	M	1.7/5656	0.03
6	Shivaguri Swamiji Road	Potholes	H	527.57/4950	10.65
		Edge cracking	H	835.95/4950	16

Table: 3 TDV, q value, CDV and PCI calculation.

Sl No	Name of the road	DV	TDV	CDV	q value(deduct value>2)	PCI =100-CDV	PCI
1	Krishnagarden road	38 / 13	51	38	2	100-38	62
2	KSIT Road	100 / 32	132	88	2	100-88	12
3	RV Architecture College Road	100 / 5 / 4	109	69	3	100-69	31
4	Nadagabhu Kempegowda Road	100 / 7 / 1	108	62	2	100-62	38
5	Sweet Homes Road	100 / 5 / 4 / 0	109	57	3	100-57	43
6	Shivaguri Swamiji Road	100 / 43	143	88	2	100-88	12

Based on the PCI values (calculated as per ASTM-D6433-11) of each road remedial measures are assessed for each road for improvement in durability of roads which in turn contributes towards passenger comfort and safety during travel.

IV. CONCLUSION

Sl No	Name of the road	PCI	Rating	Remedial measures
1	Krishna garden road	62	Fair	Routine maintenance, crack sealing and minor patching
2	KSIT Road	12	Serious	Needs reconstruction with extensive base repair
3	RV Architecture College Road	31	Very poor	Needs patching and repair prior to major overlay Milling and removal of deterioration extends the life of overlay
4	Nadagabhu Kempegowda Road	38	Very poor	Needs patching and repair prior to major overlay Milling and removal of deterioration extends the life of overlay
5	Sweet Homes Road	43	Poor	Preservative treatments (seal coating or thin non-structural overlay 2" or more)
6	Shivaguri Swamiji Road	12	Serious	Needs reconstruction with extensive base repair

This indicates that proper maintenance is needed in the future. Further traffic load and weather conditions might deteriorate the pavements if not maintained. The remedial measures corresponding to the each sample's PCI value is mentioned in the above table. Implementing those remedial measures will make the sample roads durable and safer than before.

V. ACKNOWLEDGMENT

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