

A Surveying Design of Overlay Thickness of Rigid Pavements Using Road Software

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ABSTRACT: For strengthening of deteriorated bituminous pavements is rising is a measure of rehabilitation in the use of concrete overlay. This has not found purpose in the country. This results in the lower maintenance cost is one of the rehabilitation method. Roads have low to moderate traffic rehabilitation method can be accepted for rural road network and district road. Strengthening method in the State Highways and National Highway where traffic is sufficient. Finally for the selected roads, cost comparison between concrete and asphalt overlay is done. Cost effective rehabilitation in the concrete overlay than the asphalt overlay. Using ROADS software design of whitetopping is calculated.

KEYWORDS: Road Software, Cost Analysis, Traffic, Pavement Evaluation.

1. INTRODUCTION

Pavement evaluations are performed for determination of regular checking or planned remedial action to regulate functional and structural conditions of a highway section. Deflection, layer thickness, and prioritize maintenance or rehabilitation is measured by the structural capacity is a function of structural condition. At network level performance models and prioritizes maintenance or rehabilitation efforts and funding is a function of structural and functional evaluation. At project level in order to determine the best rehabilitation strategies evaluations are more focused on establishing the root causes of present distress. Test pit of 1m x 1m were dig in the selected stretch and representative samples were collected. Thickness of pavement layers is noted. Road inventory, Traffic volume count, pavement design features, subgrade characteristics, Pavement distress survey, MERLIN for roughness measurement and BBD for deflection characteristics these are the field test to be conducted. Selected soil were evaluated in laboratory for determining Atterberg's limit, proctor density, optimum moisture content and soaked CBR. Road software created by Y.A. Agboatwala and Fatima Agboatwala. This software is simple, communating and requires no computer guidance. This covers 76 number of design programs including flexible, Rigid, Geometry, and Traffic, Highway economics and Rate analysis of 498 items of raod work, tables, charts and tender.

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Fig 1.0: A Software for the Road

II. OBJECTIVES

The objective of the present study is

- To estimate the performance of in-service flexible pavement of the selected road stretch by a complete pavement condition assessment study.
- Design of whitetopping for the weakened pavements and strengthening by asphalt pavement.
- Cost comparison of bituminous and whitetopping overlay to attain at a cost effective rehabilitation for bituminous pavements.

III. RELATED WORK

The related work of the study is to evaluate the performance of the chosen road stretch

1. Road inventory for the chosen road stretch.
2. Traffic survey for the chosen road stretch.
3. To determine pavement design features like crust thickness.
4. Collection of subgrade soil sample by trial pit excavation to find out the subgrade characteristics for the chosen road stretch.
5. To find out the condition of selected distress parameters on the pavement and expressing in the form of pavement condition index.
6. To find out surface irregularities by using MERLIN and expressed in terms of International Roughness Index (IRI) and Bump Integrator (BI).
7. To find structural adequacy of pavement using Benkelman Beam Deflection method as per IRC:81-1997.
8. Design of white topping as a rehabilitation approach for the distressed pavements as per IRC:SP:76-2008 and IRC:58-2002.
9. To find the strengthening of existing pavements by bituminous overlay as per IRC: 81-1997.
10. Cost comparison of bituminous versus white topping overlay to arrive at cost effective rehabilitation choice.
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IV. FIELD AND LABORATORY INVESTIGATION

Design of a rehabilitation project requires the data collection and detail study from the existing pavement forms an reliable and cost effective design, resulting in the identification of problems and their causes. The records of features may vary plan to plan depending on the needs and rehabilitation alternatives. In this project following surveys to be conducted as listed below.

1. Road inventory survey
2. Traffic volume count
3. Pavement Distress survey
4. Roughness using MERLIN
5. Deflection using Benkelman Beam Deflection
6. Pavement design features
7. Subgrade soil characteristics

Pavement Design Features

It is important to know the pavement design features such as the thickness of the pavement component layers when assessing the condition of existing pavement. Pavement thickness is a important factor that should be correctly known because it is used for back calculation program. Test pit of size 1m x 1m were excavated at the pavement shoulder and extending through the pavement layers upto the level of subgrade. Soil subgrade type, existing embankment soil type, details of water table were recorded in the field trial pits while assigning the crest thickness pavement layers. Pavement layers were recorded after the excavation. Water bound macadam should remained in sub-base and base.

Table 1: Summary of measurement of Pavement layers

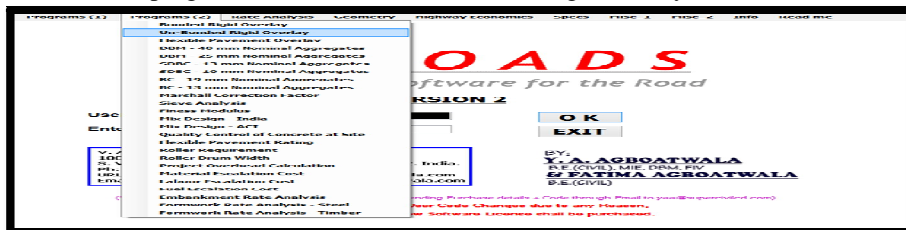
Existing Layer Thickness (mm)	SH-57 (Hanumanth Nagar-Kuvempu Nagar)
Surface Course	75mm
Base Course	150mm
Sub-Base Course	210mm
Total Thickness	435mm

Table 2: Summary of Subgrade soil

Pit No.	Index Properties						Strength Properties			Soil Classification	
	Grain Size Distribution			Atterberg's Limit			OMC (%)	MDD (gm/cc)	CBR (%)	IS Classification	HRB Classification
	Gravel (%)	Sand (%)	Silt+Clay (%)	LL (%)	PL (%)	PI (%)					
Pit No.1	-	24.6	75.4	38.4	19.09	19.31	10	24.52	5	CL(Silty Clay)	A-6(Silty Clay)
Pit No.2	-	65.1	34.9	32.1	17.33	14.77	8	27.46	9	SC(Clayey sand)	A-2-6(Clayey sand)

Design of Overlay Thickness of Rigid Pavement Using Road Software

Step 1: Go to main menu select program (2) then Select Un-Bonded Rigid overlay



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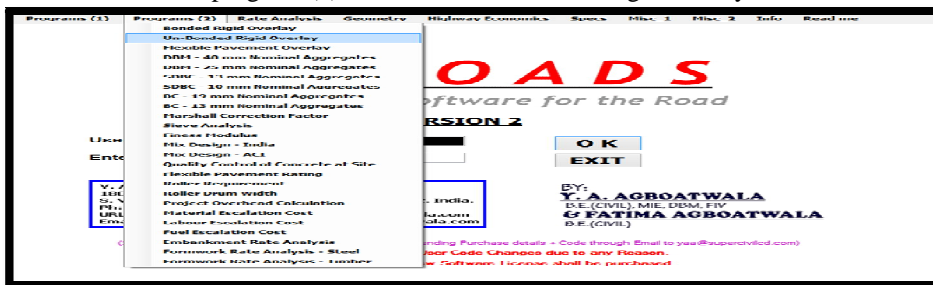
Vol. 6, Issue 4, April 2017

Step 2: Overlay Thickness

Rehabilitation of Rigid Pavement Unbonded Overlay	
Total pavement thickness required to carry out future traffic in mm	100
Pavement Condition Factor	0.74
Thickness of existing pavement in mm	75
<input type="button" value="Rehab thickness"/> <input type="button" value="Clear"/>	
***** Rehabilitation of Unbonded Pavement ***** Total pavement thickness required to carry out future traffic in mm = 100 Pavement condition factor = 0.74 Thickness of existing pavement in mm = 75 Overlay (Extra) Rehabilitation thickness in mm = 76	
<input type="button" value="Select Text"/>	
Pavement Condition Factor	1.0, When Existing pavement is in good Condition.
	0.75, When Existing pavement shows initial cracks.
	0.35, When Existing pavement is badly cracked.

Design of Overlay Thickness of Rigid Pavement Using Road Software

Step 1: Go to main menu select program (2) then Select Un-Bonded Rigid overlay



Step 2: Overlay Thickness

Rehabilitation of Rigid Pavement Unbonded Overlay	
Total pavement thickness required to carry out future traffic in mm	100
Pavement Condition Factor	0.74
Thickness of existing pavement in mm	75
<input type="button" value="Rehab thickness"/> <input type="button" value="Clear"/>	
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<input type="button" value="Select Text"/>	
Pavement Condition Factor	1.0, When Existing pavement is in good Condition.
	0.75, When Existing pavement shows initial cracks.
	0.35, When Existing pavement is badly cracked.

4.8.3. Result of Rehabilitation of Rigid Pavement Unbonded Overlay

Total pavement thickness required to carry out future traffic in mm = 100mm
 Pavement condition factor = 0.74
 Thickness of existing pavement in mm = 75mm
 Overlay (Extra) Rehabilitation thickness in mm = 76mm

V.CONCLUSION

For the computation of cost analysis for items of work basic rates have been assigned given in table 5.1. The use of computation of the cost bituminous overlay as well as whitetopping rates are appropriate. For both the bituminous and concrete overlay, costs for the items of work were calculated. For particular items of work costs were calculated as per rates revealed in table- 5.1.

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Vol. 6, Issue 4, April 2017

Table 3: Rates for Different Items of Work

Sl. No.	Items of work	Current Rates (Rs)
1.	Tack Coat	13.176/m ²
2.	Prime Coat	27.35/m ²
3.	Bituminous Macadam	4849/m ³
4.	Dense Bituminous Macadam	7405/m ³
5.	Semi Dense Bituminous Macadam	6313/m ³
6.	Bituminous Concrete	8906/m ³
7.	Pavement Quality Concrete	8620.01/m ³
8.	Milling/Scarifying	19.59/m ²

Table 4 : Cost for Bituminous Overlay

Sl.No.	Items	Unit	Quantity	Rate(Rs)	Cost(in Lakh)
1.	Prime coat	Sqm	14000	27.35	3.829
2.	Tack coat	Sqm	14000	13.176	1.845
3.	Wearing Course, BC	Cum	560	8906	49.873
4.	Binder 100-mm, DBM	cum	1400	7405	103.67
5.	Granular Base	cum	3500	338	11.83
6.	Granular Sub- Base	cum	3220	2086.56	67.190
7.	Contingencies cost	-	-	5%	11.91
8.	Total amount	250.147			

Table 5: Cost for Whitetopping Overlay

Sl.No.	Items	Unit	Quantity	Rate(Rs)	Cost(in Lakh)
1.	Depth of 25mm scarifying /milling	Cum	350	19.59	0.068
2.	Tack coat (7.0×2000)	Sqm	14000	13.176	1.845
3.	Granular base,250 mm (7.0x2000x0.25)	Cum	3500	338	11.83
4.	Granular Sub- Base, 230mm (7.0x2000x0.23)	Cum	3220	2086.56	67.190
5.	M40 grade Pavement quality concrete (7x2000x0.076)	Cum	1064	8620.01	91.716
6.	Total amount	172.649			

Table 6 :Comparison cost of whitetopping and Bituminous overlay

Scenario	SH-57
Thickness of Bituminous Overlay(mm)	80
Thickness of Whitetopping (mm)	76
Total Cost of Bituminous overlay (Rs in lakhs)	250.147

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Vol. 6, Issue 4, April 2017

Total Cost of Whitetopping overlay (Rs in lakhs)	172.649
Saving in Whitetopping (Rs in lakhs)	77.49
Saving in (%)	30.98

1. Poor maintenance of drains, shoulder, and pavements revealed from the condition distress survey. To enhance the life of the pavement periodic maintenance is needed.
2. Visual ratings indicate satisfactory condition of road from the present serviceability and pavement condition rating varies in the range 1.5 -4.5 and 50-100. From Transport Research Board PCR scale is 75.735 so the road needs resurfacing within 4-5 years.
3. Rut is the main distress affecting the chosen road. From PCI and BI values requires "Resurfacing".
4. From the existing flexible pavement are structurally poor is found from the deflection data existing crust details. Hence the road need structural overlay.
5. Designed white topping for unbounded rigid overlay, rehabilitation thickness is 76 mm.
6. It is cost effective than the asphalt overlay can be observed from the cost comparison between whitetopping and asphalt overlay. WT requires little maintenance than bituminous pavement.

RECOMMENDATION

1. To extend the life of the pavements maintenance of road should be given satisfactorily.
2. To provide access to private farm lands to avoid the damage to the drain and shoulders to prevent this, adequate number of culverts is necessary.
3. On both side of carriageway it is necessary to provide suitable shoulder width.

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