Total No. of Questions : 12]

SEAT No. :

P1174

[Total No. of Pages : 12

[4659] - 22

B.E. (Civil)

B : ADVANCED TRANSPORTATION ENGINEERING

(2008 Pattern) (Elective - IV) (Semester - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q. 8, Q.9 or Q.10, Q.11 or Q.12 from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Explain in brief the following projects **[6]**

i) Mumbai Trans harbours link

ii) Pune Metro

b) What is regression analysis? How is it useful in traffic and transportation planning? Explain with a case study. **[6]**

c) Explain the travel demand forecasting process with a flow diagram. **[6]**

OR

Q2) a) Explain in brief the following projects. **[6]**

i) Bharat Jodo Pariyojana

ii) Ports connectivity projects

b) Explain how O-D surveys are carried out and how the data is documented and used in transportation planning. **[6]**

c) Discuss the various factors affecting the modal split. **[6]**

P.T.O.

Q3) a) List the Various urban transportation systems and explain any 3 of them in brief. **[10]**

b) Discuss problems of the transportation system adopted in Pune city. **[6]**

OR

Q4) a) Explain concepts of ITS and elaborate the various technologies used in it with examples. **[10]**

b) Discuss various solutions to the problems of congestion in Pune City. **[6]**

Q5) The client associated with Infrastructure development has decided to evaluate two highway proposals with the following cash flows. **[16]**

	Option I			Option II	
Year	Cash Inflow (Rs.)	Cash Outflow (Rs.)	Year	Cash Inflow (Rs.)	Cash Outflow (Rs)
1	-	20,00,000	1	-	45,00,000
2	-	35,00,000	2	20,00,000	2,00,000
3	-	30,00,000	3	12,00,000	3,00,000
4	25,00,000	3,00,000	4	15,00,000	1,50,000
5	30,00,000	3,00,000	5	21,00,000	2,50.000
6	35,00,000	3,00,000	6	9,00,000	1,50,000
7	40,00,000	4,00,000	7	3,00,000	2,50,000

The decision criteria is based on NPV at 10% Work out the values and suggest.

i) Whether both proposals area worth investing and

ii) The better alternative, stating reason.

OR

Q6) Explain merits and demerits of **[16]**

a) ARR and IRR

b) BOT and BOOS

c) NPV and B/C

d) BT and BOO

SECTION - II

Q7) Explain the following methods of traffic counting with examples **[18]**

a) Photographic method

b) Moving vehicle method

c) Licensed plate survey method

OR

Q8) What are household surveys? How are they conducted? What are the advantages? Explain the standard household survey format and how data is collected using it with an example. **[18]**

Q9) a) Design a flexible pavement for the following data, as per IRC-37. **[12]**

i) 2 lane single carriageway

ii) Expected year of completion - 2015

iii) CVPD in one direction in year 2010 -2000

iv) Design life - 15 years

v) Traffic growth rate - 7.5%

vi) Terrain - hilly

vii) C.B.R. for subgrade - 5%

Also draw a typical cross-section showing all the basic layers

b) Discuss advantages of flexible pavements over rigid pavements. **[4]**

OR

Q10) a) Design a flexible pavement by using IRC-37 and the data given in Problem 9a, except for the change that the road is a 4 lane dual carriageway instead of the 2 lane single carriageway. Also draw the typical cross-section. **[12]**

b) Explain how pavement riding quality is measured, with an example. **[4]**

Q11) a) Explain various types of over lays and compare/contrast amongst them. **[8]**

b) Explain the design procedure for any types of overlay based on the Provisions made in IRC-81. Before designing an overlay what needs to be assessed and why/ Explain. **[8]**

OR

Q12) Design a rigid pavement as per IRC-58 and draw the plan and cross-section showing correctly all relevant details with the correct nomenclature, based in the following data. **[16]**

a) 2 way CVPD-3000

b) Flexural strength of concrete = 48 kg/cm^2

c) Effective modules of subgrade reaction = 8 kg/cm^2 per cm.
d) Elastic modulus of concrete = 3.3×10^5 kg/cm^2
e) Poissons ratio = 0.18
f) Coefficient of thermal expansion of concrete = 10×10^{-6} per °C.
g) Tyre pressure = 8.2 kg/cm^2
h) Traffic growth rate = 6%
i) Design life = 20 years
j) Spacing of contraction joints = 4.5 m
k) Slab width 4.0 m.
l) Load safety factor = 1.05
m) Maximum temperature difference between the top and bottom of the slab = 23°C
n) Centre to centre distance between tyres = 32 cm
o) Axle load spectrum is as follows

Single Axle Loads		Tandem Axle Loads	
Load in Tons	%	Load in Tons	%
20	0.5	36	0.3
18	1.4	32	4.0
16	3.8	28	3.0
14	12.0	24	2.0
12	20.0	20	4.0
10	22.0	16	1.0
Less than 10	25.0	Less than 16	1.0

p) Trial Thickness = 30 cms
q) Use following table if required

L/l or B/l	C	L/l or B/l	C
1	0.000	7	1.035
2	0.042	8	1.075
3	0.178	9	1.085
4	0.445	10	1.080
5	0.725	11	1.060
6	0.925	12	1.000

Check whether the pavement is safe for

i) Critical condition with dowel bars and

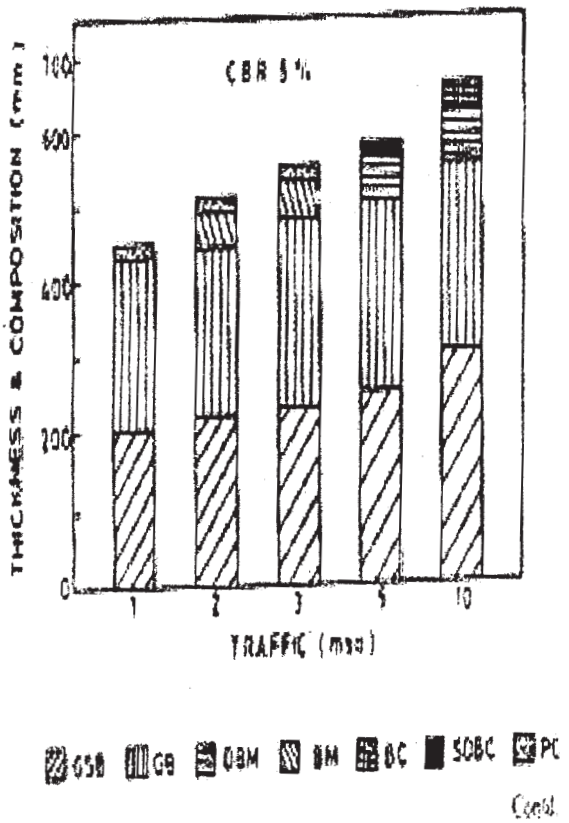
ii) Critical condition without dowel bars.

If the pavement fails, design a suitable pavement thickness so as to withstand all the critical conditions.

PAVEMENT DESIGN CATALOGUE

PLATE 1 - RECOMMENDED DESIGNS FOR TRAFFIC RANGE 1-10 msa

CBR 5%					
Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION			
		Bituminous Surfacing		Granular Base (mm)	Granular Sub-base (mm)
		Wearing Course (mm)	Binder Course (mm)		
1	430	20 PC		225	205
2	490	20 PC	50 BM	225	215
3	530	20 PC	50 BM	250	230
5	560	25 SDBC	55 DBM	250	230
10	660	40 BC	70 DBM	250	300



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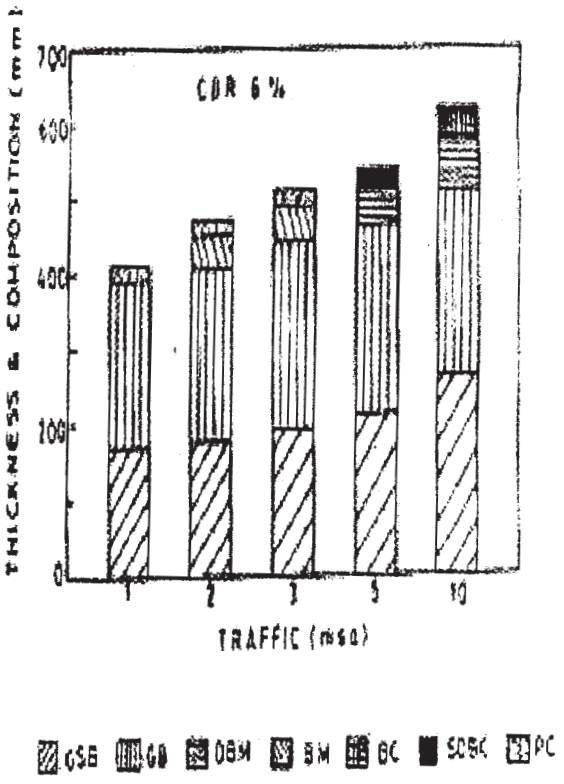
PAVEMENT DESIGN CATALOGUE

PLATE 1 - RECOMMENDED DESIGNS FOR TRAFFIC RANGE 1-10 msa

CBR 6%					
Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION			
		Bituminous Surfacing		Granular Base (mm)	Granular Sub-base (mm)
		Wearing Course (mm)	Binder Course (mm)		
1	390	20 PC		225	165
2	450	20 PC	50 BM	225	175
3	490	20 PC	50 BM	250	190
5	515	25 SDBC	50 DBM	250	210
10	615	40 BC	65 DBM	250	260



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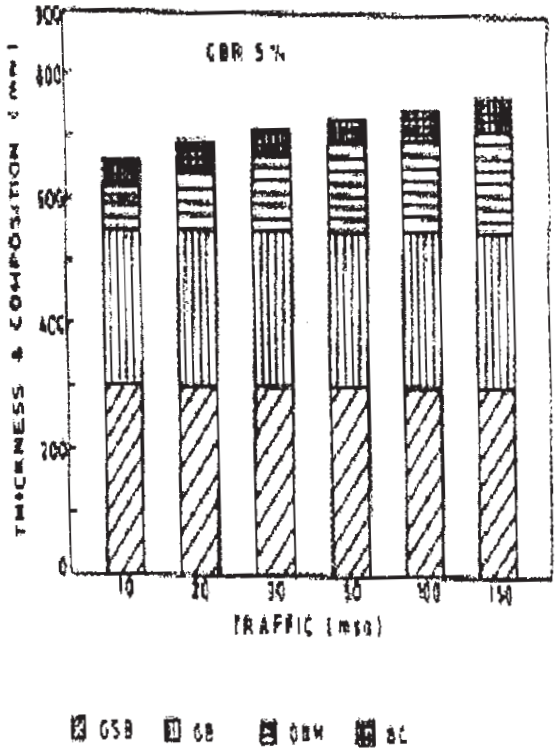
PAVEMENT DESIGN CATALOGUE

PLATE 2 - RECOMMENDED DESIGNS FOR TRAFFIC RANGE 10-150 msa

CBR 5%				
Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION		
		Bituminous Surfacing		Granular Base & Sub-base (mm)
		BC (mm)	DBM (mm)	
10	600	40	70	Base + 250 Sub-base + 300
20	690	40	800	
30	710	40	120	
50	730	40	140	
100	750	50	150	
150	770	50	170	



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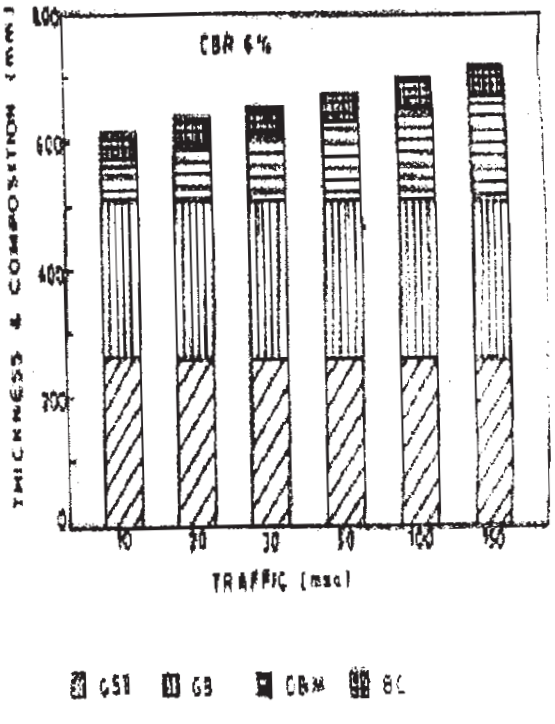
PAVEMENT DESIGN CATALOGUE

PLATE 2 - RECOMMENDED DESIGNS FOR TRAFFIC RANGE 10-150 msa

CBR 6%				
Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION		
		Bituminous Surfacing		Granular Base & Sub-base (mm)
		BC (mm)	DBM (mm)	
10	615	40	65	Base + 250 Sub-base + 250
20	640	40	90	
30	655	40	105	
50	675	40	125	
100	700	50	140	
150	720	50	160	



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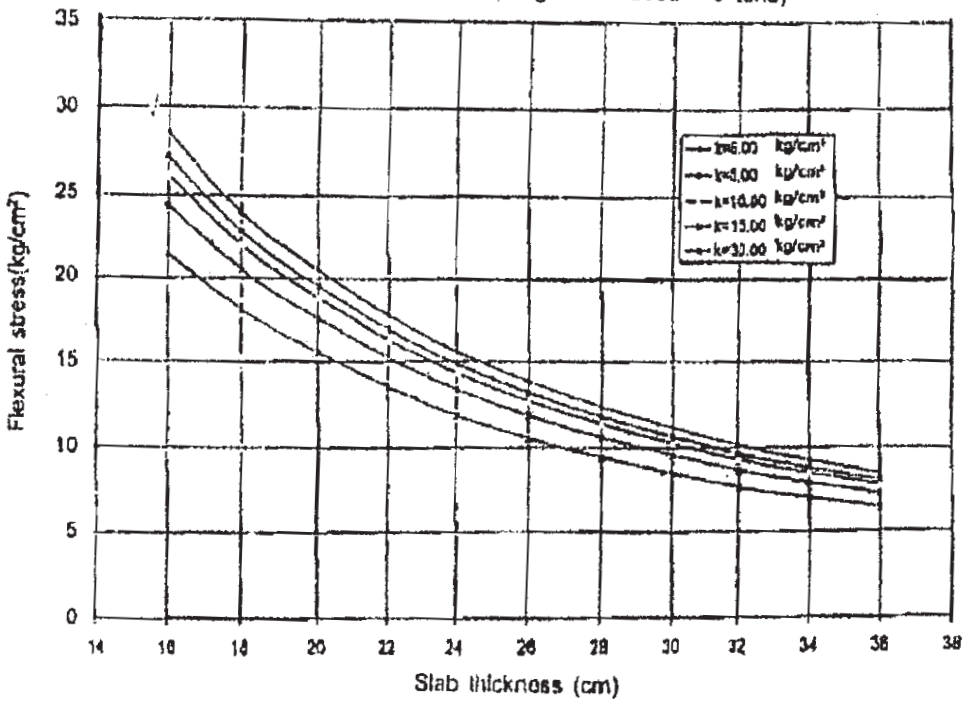
Appendix-1 (Contd.)

Stresses in Rigid Pavement (Single Axle Load = 8 tons)



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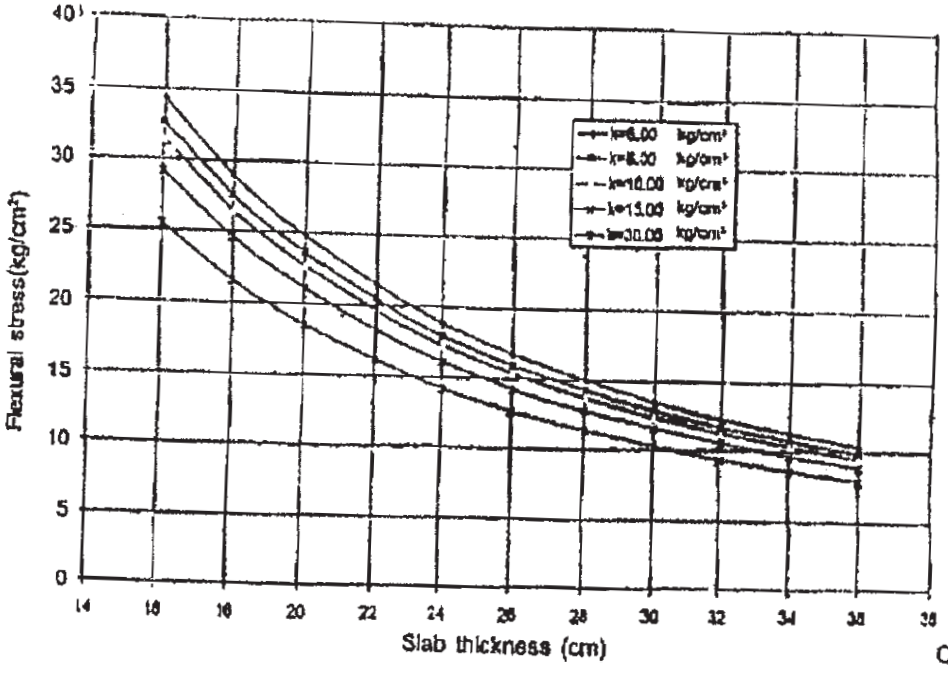
Appendix-1 (Contd.)

Stresses in Rigid Pavement (Single Axle Load = 10 tons)



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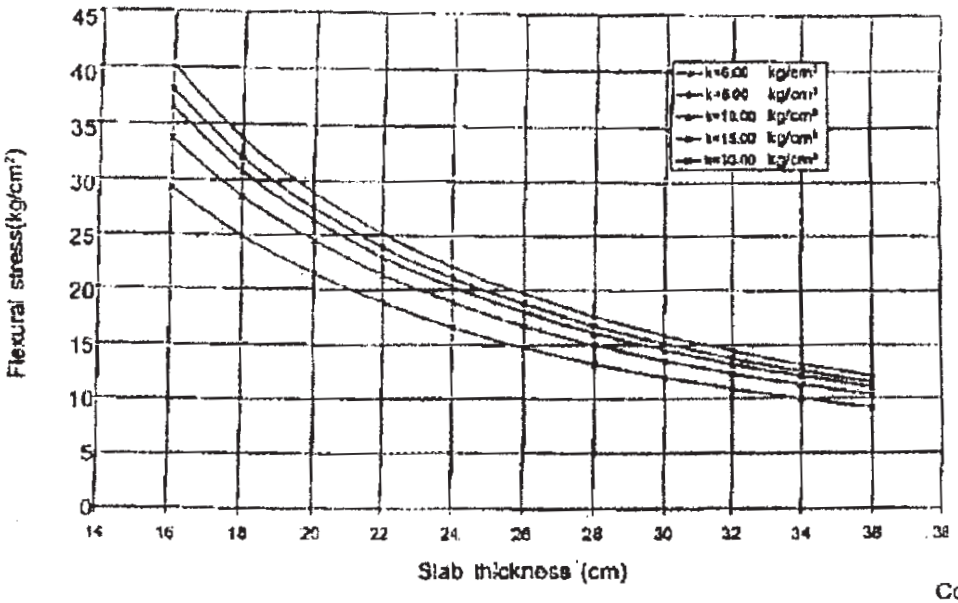
Stresses in Rigid Pavement (Single Axle Load = 12 tons)



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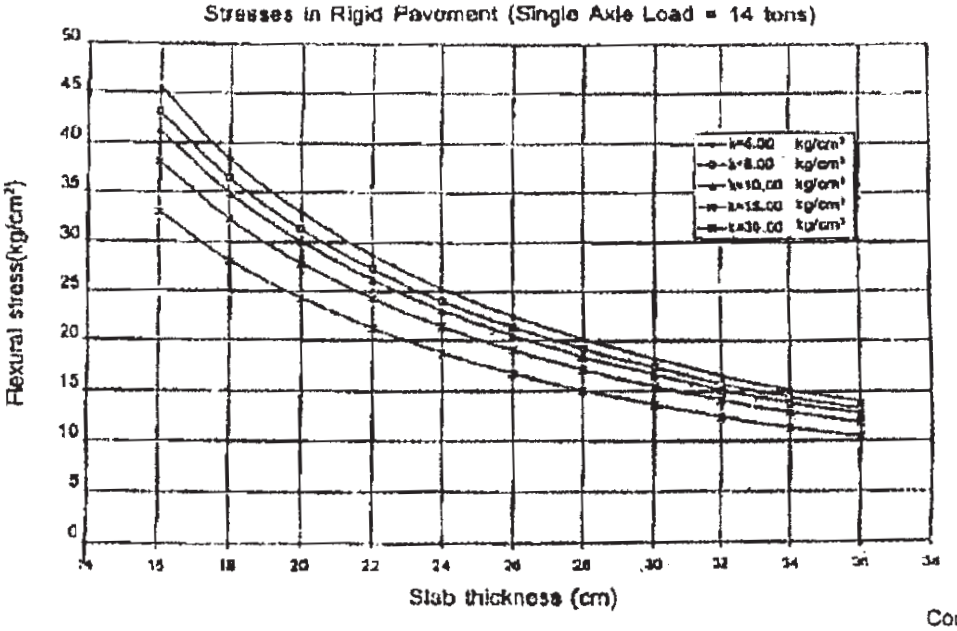
Appendix-1 (Contd.)

Stresses in Rigid Pavement (Single Axle Load = 14 tons)



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Appendix-1 (Contd.)

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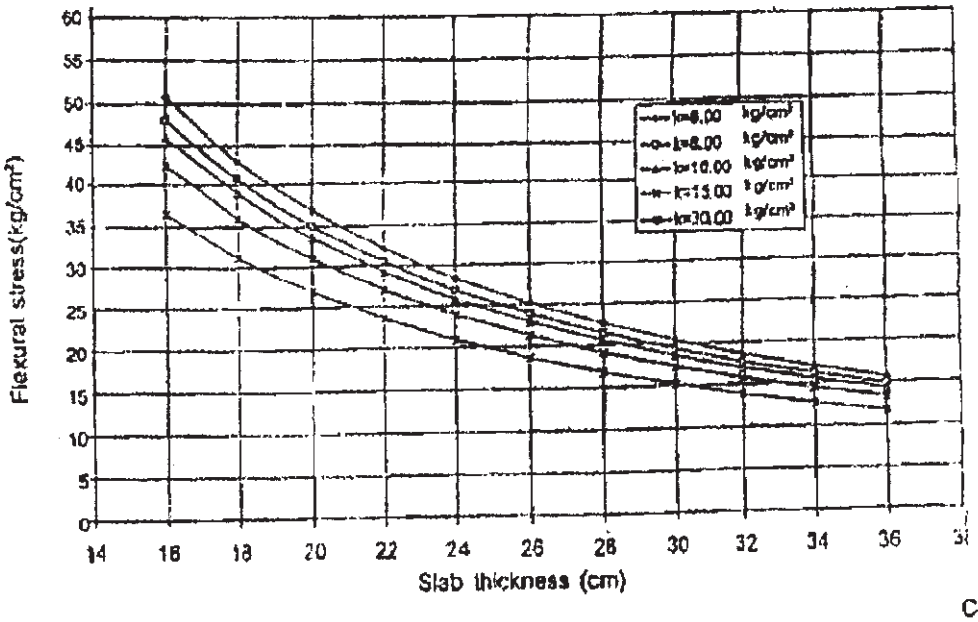
Stresses in Rigid Pavement (Single Axle Load = 16 tons)



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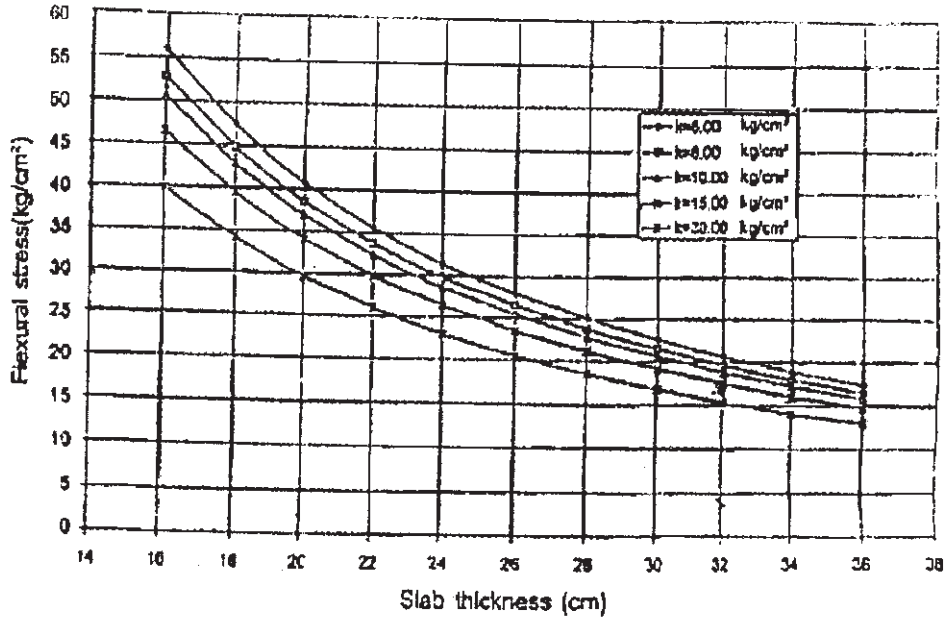
Appendix-1 (Contd.)

Stresses in Rigid Pavement (Single Axle Load = 18 tons)



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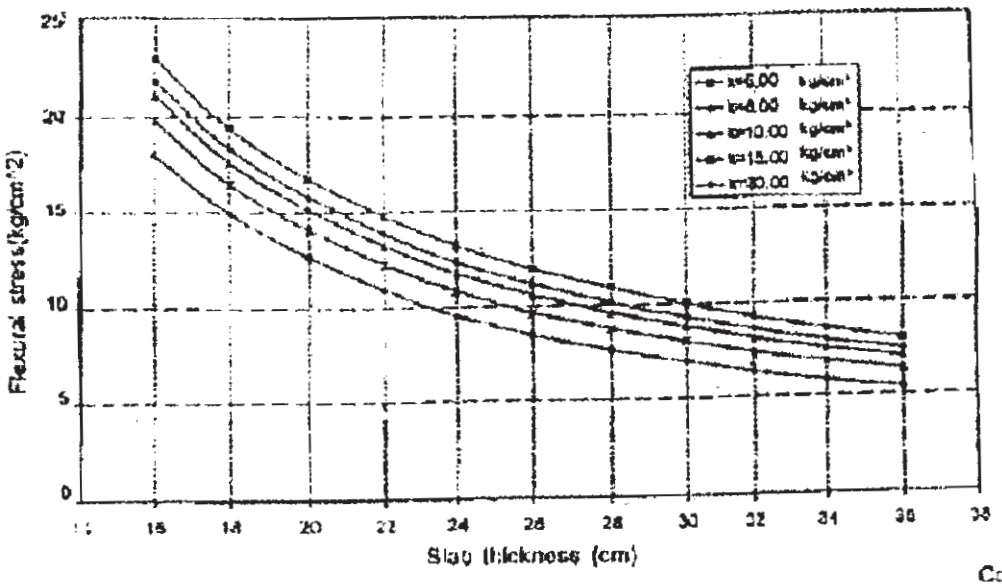
Stresses in Rigid Pavement (Tandem Axle Load 16 tons)



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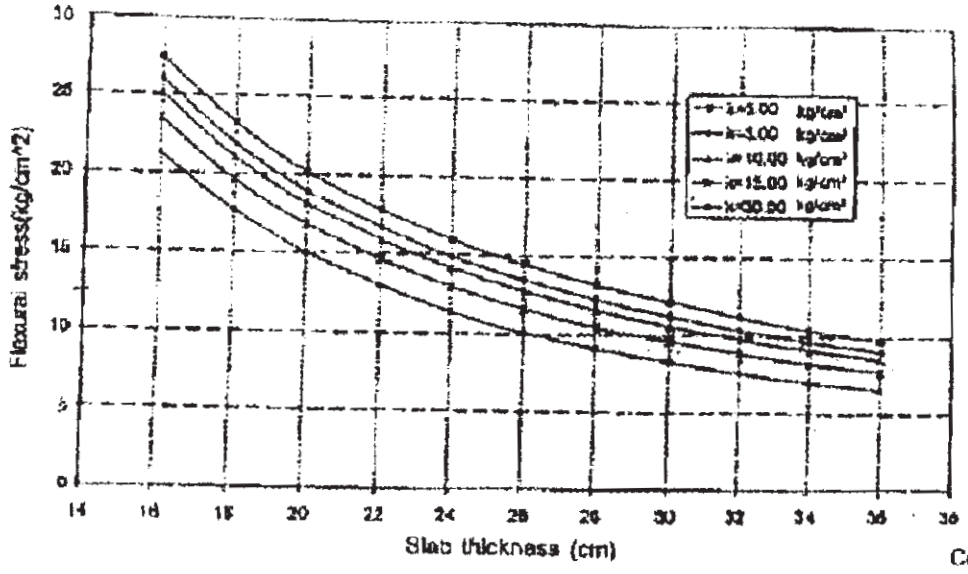
Appendix-1 (Contd.)

Stresses in Rigid Pavement (Tandem Axle Load 20 tons)



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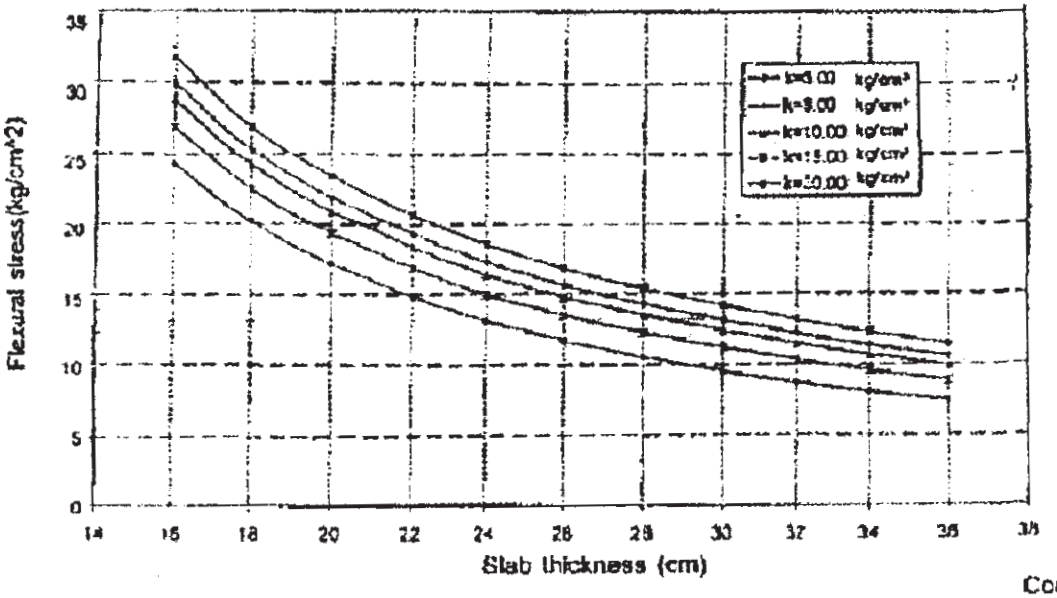
Stresses in Rigid Pavement (Tandem Axle Load 24 tons)



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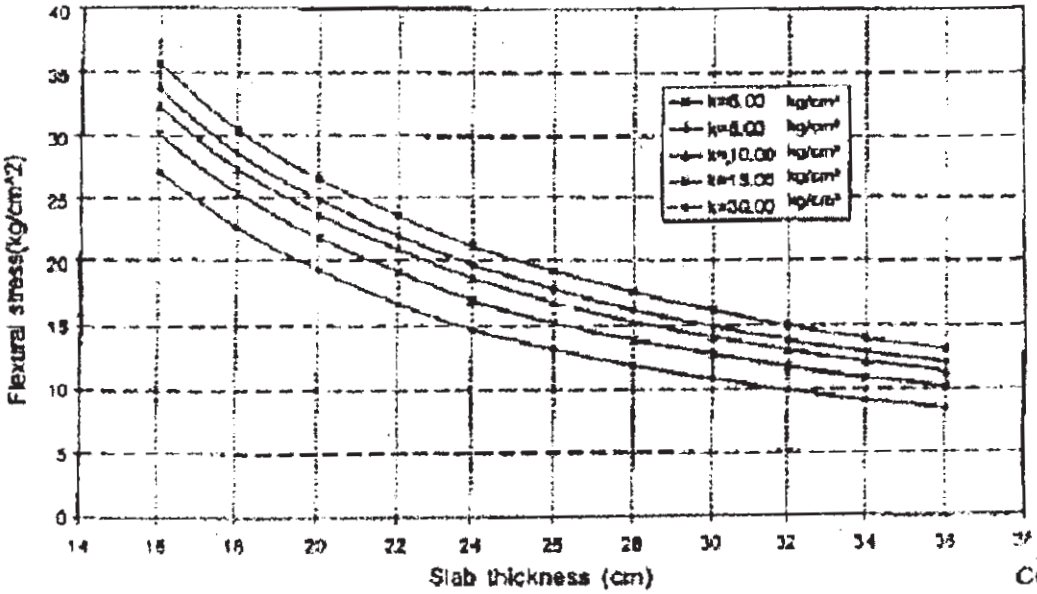
Appendix-1 (Contd.)

Stresses in Rigid Pavement (Tandem Axle Load 28 tons)



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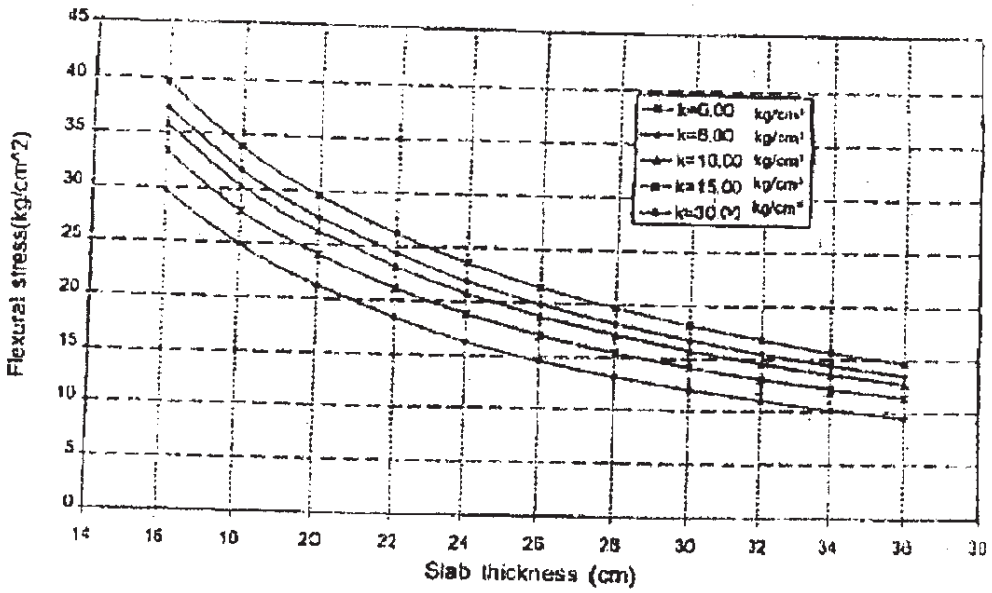
Stresses in Rigid Pavement (Tandem Axle Load 32 tons)



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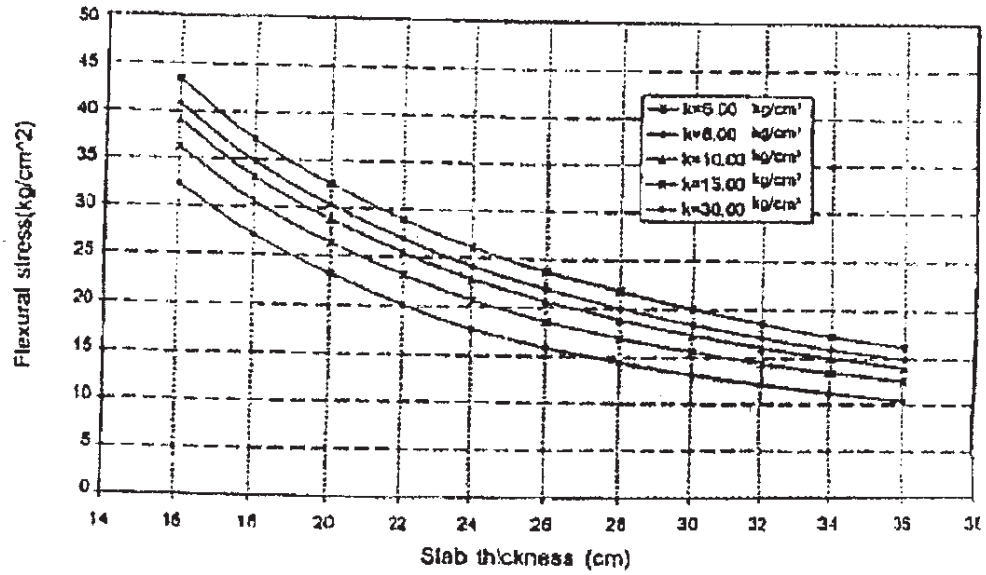
Stresses in Rigid Pavement (Tandem Axle Load 36 tons)



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