2012 - 2013

4(b)

No. of trucks/day in each direction

$$= \left(\frac{450 \times 15}{100}\right) \times \frac{1}{2} = 33.75 \text{ (daily rate)}$$

Projection factor for 20 years (considering a 3 percent growth annually) = 1.8 (assumed)

Total no. of trucks/day in each direction

$$= 33.75 \times 1.8$$

$$= 61 \text{ (projected yearly rate)}$$

Sample Calculation for actual repetition

For 13S actual no. of repetition

$$= \left(\text{No. of axles per 100 trucks} \times \frac{61}{100}\right) \times 365 \times 20$$

$$= 8 \times \frac{61}{100} \times 365 \times 20$$

$$= 35624$$

For Q.No 4(b)

Calculation of Pavement Thickness

Project: [illegible]

Total Thickness: 7.5 in
Subbase-subgrade, k: 140 pci
Modulus of Rupture, MR: 550 psi
Load safety factor, LSF: 1.2

Doweled joints: yes X no —
Concrete shoulder: yes — no X
Design Period: 20 years

6 in ontreated subbase

Axle Load, kips	Multiplied by LSF ×1.2	Expected repetitions	Fatigue analysis		Erosion Analysis	
			Allowable repetitions	Fatigue Percent	Allowable repetitions	Damage Percent
1	2	3	4	5	6	7

8. Equivalent stress: 283.2 — 10. Erosion factor: 2.898
9. Stress ratio factor: 0.515

Single Axles

13S	15.6	35624	unlimited	0	40,000,000	0.09
15S	18.0	32506.9	300,000	10.84	14,000,000	0.23
17S	20.4	27163.3	50,000	54.33	5,000,000	0.54
19S	22.8	24046.2	100,00	24.05	2,600,000	0.92
21S	25.2	14249.6	1,900	7.50	1,500,000	0.95

11. Equivalent stress: 246 — 13. Erosion factor: 3.036
12. Stress ratio factor: 0.447

Tandem Axles

23T	27.6	33842.8	unlimited	0	30,000,000	0.11
25T	30.0	37405.2	unlimited	0	15,000,000	0.25
27T	32.4	40077	unlimited	0	8,000,000	0.50
29T	34.8	49873.6	unlimited	0	5,250,000	0.95
31T	37.2	41858.2	2,000,000	2.09	3,300,000	1.27
33T	39.6	8015.4	425,000	1.89	2,400,000	0.33
35T	42.0	6234.2	210,000	2.97	1,750,000	0.36
37T	44.4	4007.7	80,000	5.00	1,200,000	0.33
39T	46.8	4153	45,000	9.90	880,000	0.51
			Total	118.57	Total	7.34

Total Fatigue & Damage = (118.57 + 7.34) %

= 125.91 %

The assumed thickness of 7.5" is under-estimated.

Start second trial assuming, t = 8.5"