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PAPER :- HIGHWAY & TRAFFIC ENGINEERING

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Q1 what is the difference b/w flexible & Rigid Pavement?

Ans:- FLEXIBLE PAVEMENTS:-

1- Grain to grain load transfer.
2- Initial cost is low.
3- Joints are not required.
4- Durability is less.
5- Good subgrade is required.
6- Temperature variation has no any effect on the stress variation
7- Life span is short 15 years
8- Repair work is easy.
9- Maintence cost is high
10- Requires less curing time.

RIGID PAVEMENTS:-

1- slab action takes place.
2- Initial cost high
3- Joints are required.
4- Durability is high.
5- Good subgrade is not required.
6- Temperature variation effects the stress variation

7- long life span 30 years.
8- Repair work is tough
9. maintenance cost is low
10- Require much caring time

Q6- What are the advantages of water bound over wet mix macadam?

Ans:- WATER BOUND MACADAM:-

The concept of water bound macadam road was suggested by John Macadam, who was a scottish engineer. The road who wearing course consists of clean crushed aggregates, mechanically interlocked by rolling. & bound together with filler material & water laid on well compacted base course, is called water bound macadam (W.B.M) roads.

ADVANTAGES of WATER BOUND MACADAM:-

1- Water bound macadam is superior in quality because the material are carefully graded & the resulting mass is almost void less compacted mass.

2- The interlocking of aggregates particles imparts adequates strenght of the material selected for filling the voids. These ensure non-entry of the plastic material of the subgrade into the voids.

3- Water bound macadam is less costly as compared to bituminous base course.

Q6: what is the difference between asphalt & bitumen?

Ans ASPHALT:→

1- Asphalt Pavement are durable with layer depth 25-40 mm.

2- life span 20+ year.

3- Asphalt surface is made smoother & more skid. resistance ensuring the driver saftely & minimal noise

4- Installation is comparatively costlier.

BITUMEN :-

① Bitumen pavement are less durable with layer of depth of 10-20 mm.

② life span 5-10 years.

③ the loose fragement on bitumen pavement make driving experence noisey & can wear down consequenty casuing saftely.

④ Cheap to its fall compared to asphalt

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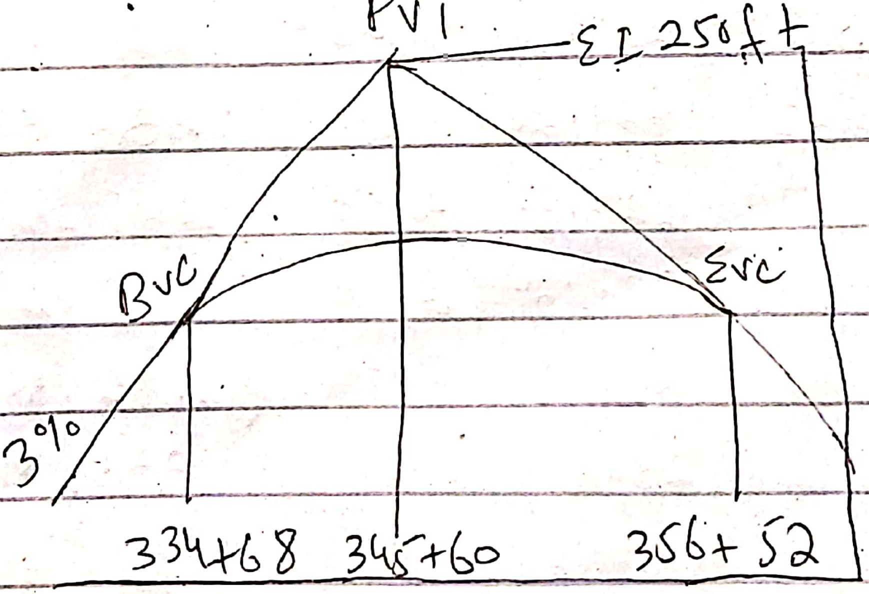
Q No (2) :-

A crest vertical curve joining a +3 percent & a −4% grade is to be designed for 75 mi/h. If the tangents intersects a station (345 + 60.00) at an elevation of 250 ft, determine the stations & elevation of the BVC & EVC. Also, calculate the elevation of intermediate points on the curve at the whole station?



SOLUTION :-

for a design speed of 75 m./h

$K = 312$

for table

Minimum lenght = 512 × [3 - (-4)] = 2184 ft

Station of BVC = (345+60) - ($\frac{21+84}{2}$) = 334 + 60

Station of EVC = (334+68) + ($\frac{21+84}{2}$) = 356+ 52

Elevation of BVC = 250 - (0.03 × $\frac{2184}{2}$) = 217.24 ft

The remainder of computation is efficiently done lessing the format shown in table

station	Distance BVC/ (ft)	Tangent Elevation (ft)	offset/ $[r = \frac{A x^2}{200^2}]$ ft	Curve elevation tangent elevation offset (ft)
BVC 334+68	0	217.24	0.01	217.24
BVC 335+00	32	217.2×32/100×3 = 218.20	0.02	218.18
BVC 336+00	132	221.20	0.28	220.92
BVC 337+00	232	224.20	0.86	223.34
BVC 338+00	332	227.20	1.77	225.43
BVC 339+00	432	230.20	2.99	227.21
BVC 340+00	532	233.20	4.54	228.66
BVC 341+00	632	236.20	6.40	229.80
BVC 342+00	732	239.20	8.59	230.61
BVC 343+00	832	242.20	11.09	231.11
BVC 344+00	932	245.20	13.92	231.28
BVC 345+00	1032	248.20	17.07	231.13
BVC 346+00	1132	251.20	20.54	230.66
BVC 347+00	1232	254.20	24.32	229.88

BVC 348+00	1332	257.20	28.43	228.77
BVC 349+00	1432	260.20	32.86	227.34
BVC 350+00	1532	263.20	37.61	225.59
BVC 351+00	1632	266.20	42.68	223.052
BVC 352+00	1732	269.20	48.07	221.13
BVC 353+00	1832	272.20	53.79	218.41
BVC 354+00	1932	275.20	59.79	215.38
BVC 355+00	2032	278.20	66.17	212.03
BVC 356+00	2132	281.20	72.84	208.36
EVC 356+52	2184	282.76	76.44	206.32

Q No (3) :-

A flexible highway is to be designed

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Mr of subgrade 6x1500 lb/in^2 = 9000 lb/in^2

Solo:-

Draw a line joining the relaibility level of 99% & over all-standesed divation So of 0.49 & extend line to intersect the first TL line at Point A.

STEP 2:-

Draw a line Joining Point A to the ESAL of 2×10^6 & extend this line to intersed the first TL ∅ line at point B.

STEP 3:-

Draw a line Joining Point B & resilient modulus (Mr) of base course & extend their line to intersect the design serviceability loss chart at Point C.

STEP 4:-

Draw a horizontal line for Point C to intersect the design serviceability loss (PSI) curve at point D so here

$\Delta PSI = 4.5 - 2.5 = 2$

STEP 5:-

The structure number require to protect the base course & to find the D_1 of the surface coarse is 2.6

STEP 6 :-

Determine the appropriate structure layer cofficient for each construction material Resiliant value of asphalt

$= 450{,}000\ lb/in^2$

there fore

$a_1 = 0.44$

$D_1 = SN_1 / a_1$

$= 2.6 / 0.44$

$= 5.92$

Thickness should be taken to the nearst 0.5 inches so the thinkness of the surface course is 6"

$SN_1 = D_1 \times a_1$

$= 6 \times 0.44$

$= 2.64$

Now find SN_2 & D_2 (Base course)

find the value of a_2 from layer cofficient table & m_2 from drainage cofficient table

Thinkness of base course (D_2)

$D_2 = (SN_2 - SN_1)/a_2 m_2$

$D_2 = (3.8 - 2.64)/.14 \times 0.80$

$D_2 = 10.36''$

use 12''

So the thinkness of base course is 12''

$SN_2 = 0.14 \times 0.80 \times 12 + SN_1$

$SN_2 = 1.34 + 2.64$

$SN_2 = 3.98$

finding SN_3 & D_3 [sub base course] & also m_2 from their respective table

$D_3 = (SN_3 - SN_2)/a_3 m_3$

$D_3 = (4.4 - 3.98)/0.10 \times 0.80$

$D_3 = 5.24''$

we will use 6'' as a sub base

$SN_3 = 2.64 + 1.34 + 6'' \times 0.10 \times 0.80$

$SN_3 = 4.46 > 4.4$ okey.

FINAL DESIGN:—

→ Surface course = 6''

→ Base course = 12''

→ sub base = 6''

→ Total Pavement thinkness = 24''

Q4- what are the different pavement distresses? Explain in detail?

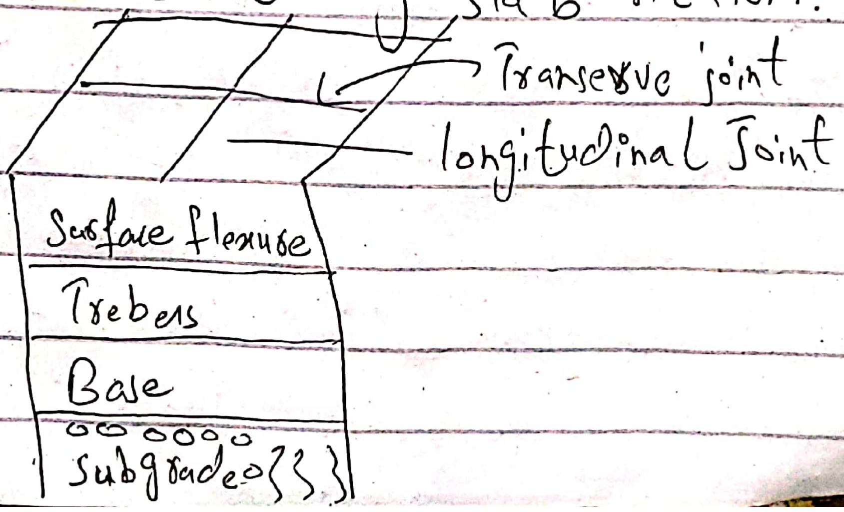
Ans:- DIFFERENT PAVEMENT DISTRESSES:-

INTRODUCTION:-

A highway pavement a structure of consisting super imposed layers of processed materials. The pavement structure should be able of provide a surface of acceptable riding quality, Adequate skid resistance favourable light reflecting characteristic & low noise pollution.

RIGID PAVEMENT:-

Rigid pavement have sufficient flexual strenght to transists the wheel load stressess to a winder area below. In rigid pavement load is distribute by slab Action.



FACTOR AFFECTING PAVEMENT PERFORMANCES

- Traffic contact pressure, wheel loading, Axle configuration moving load.
- Structural model-lya elastic model.
- Material characterization.
- Environment factor temperature moisture.

COMMON RIGID PAVEMENT DISTRESS:—

1) Spalling
2) faulting
3) Cracking
4) longitudal crack.
5) Slab cracking
6) Durability crack.
7) Polished Aggreater
8) Dumping & water Bleeding
9) Shrinkage Cracking

DETAILS:—

1) SPALLING AT the JOINTS:—

Cracking Braking or chipping of Joints /Crack edges. Usually occurs with in about 0.6m. (2ft) of Joint/crack edge

- It causes of infiltration of incompresible material & subsequent expension

(can also cause blowsups)

2) FAULTING:-

A difference in elevation across a joints or crack usuallgy assoicated with undowled JPCP. usuallgy the approach slab is higher then the leave slab due to pumping.

3) LONGITUDINAL CRACKING:-

longitudinal crack not associated with corner breaks or blows up that extend across the ~~entire breaks~~ or ~~blows up at~~ entire slabs in to two or four pieces.

4 CORNER CRACKING:-

A slab that interest the Pcc slab joint near the corner with in about 2m (6ft) or so. A corner extend through the entire slab & caused by high croner stress.

5) RUTTING:-

Surface depression in a wheel path are, particulary evident after a rain when they are filled with water.

Causes:-

1) Insufficient compaction.
2) subgrade routing
3) Improper mix design.

REPAIR:-

1) slight ruts (<1/3 inch deep.

6) BLEEDING:-

loss of skid resistance when wet.

CAUSES:-

- Excessive asphalt binder in the ~~HMA~~ HMA.
- Excessive application of Asphalt blinder during BST aplication

7) POLISHED AGGREGADE:-

CAUSES:-

Repeated traffic application this can be occur quicker in the aggregate is susceptible to abrasion.

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