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PAPER:-

HIGHWAY & Traffic ENGINEER

SUBMITTED To:-

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DATED:-

22/06/2020

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QNo:1 Difference b/w Flexable and rigid pavement.

Ans:

Flexable pavement	Rigid pavement
① grain to grain load transfer	① Slab action take place
② Joints are not required	② joint are required
③ initial cost is low.	③ initial cost is high
④ less Duribility	④ Duribility is high
~~⑤ good Submar Subgrade is requir~~ ⑤ good Subgrade is required	⑤ good subgrade is not required
⑥ Temperture varition no effects the stress variction	⑥ temparture variation effect the stress variation
⑦ life span is short ~15 year	⑦ Long life span ~30 years
⑧ Repear work is easy.	⑧ Repear work is tough

QNo:2 What are the adventages of water bound over wet mix macadam?

Ans: ① water bound macadam is superier in quality b/c the material are carefully graded and the resulting mass is almost void less compacted mass.

⑦ the interlocking of aggregate particles impacts adequate strength of materials selected for filling the voids. these insure non-entering of the plastic materials of the subgrade into the voids.

⑧ water bound macadam is less costly as compared to bituminous base course.

Q.No:3 What are the difference b/w asphalt and bitumen

Ans::

Asphalt	bitumen
① Asphalt pavement are durable with a layer depth 25-40 mm	① bitumen pavement are less durable with layer of depth 10-20 mm
② life span 20+year	② life span 5-10 years
③ Asphalt surface is made smoother and more skid resistant ensuring the driver saftey and minimal noise	③ the loose fragements on bitumen pavement make the driving experence noiser and can wear down consequently causing saftey
④ installation is comparativelly cost lier	④ Cheap to install compared to asphalt

Q No. 2 A Crest vertical Curve joining a +3 percent and a -4 percent grade is to be designed for 75 m/h. If the tangent intersect at station (345 + 60.00) at an elevation of 250 ft, determine the station and elevation of ~~Aae~~ BVC and EVC. Also calculate the elevations of intermediate point on the Curve of the whole Station

Ans

Solution For design speed of 75 m/h, K = 312 (from table)

minimum length = 312 (3 - (-4)) = 2184 ft

Station of BVC = (345 + 60) - $\left(\frac{21+84}{2}\right)$ = 334 + ~~8~~ 68

Station of EVC = (334 + 68) + (21 + 84) = 356 + 52

Elevation of BVC = 250 - $\left(0.05 \times \frac{2184}{2}\right)$ = 217.74 ft

the remain of the ~~Complition~~ Computation is effectively done desining the format shown in table

Station	distance BVC (ft)	tangent Elevation (ft)	offset $r = \left(\frac{Ax^2}{200L}\right)$ ft	Curve elevation tangent elevation offset ft
BVC 334+68	0	217.24	~~0.00~~ 0.01	217.24
BVC 335+00	32	217.24	0.02	218.18
BVC 336+00	132	221.20	0.28	220.92
BVC 337+00	232	222.21	0.86	223.34

Station	Distance BVC (ft)	Tangent Elevation (ft)	Offset V=Ax²/200L (ft)	Curve elevation (tangent elevation - offset)
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	731	239.20	8.59	230.61
BVC 343+00	832	242.20	11.09	231.11
BVC 344+00	932	245.20	13.92	231.25
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	24.30	229.88
BVC 348+00	1332	257.20	28.43	228.27
BVC 349+00	1432	260.20	32.86	227.34
BVC 380+00	1532	263.20	37.61	225.59
BVC 351+00	1632	266.20	42.68	223.052
BVC 352+00	17.32	269.20	48.07	221.13
BVC 353+00	1832	272.20	53.79	218.41
BVC 354+00	1932	275.20	59.82	215.38
BVC 355+00	2032	278.20	66.17	212.05
BVC 356+00	2132	281.20	72.85/7~~[illegible]~~4	208.35
BVC 350+00	2184	282.76	76.44/7~~[illegible]~~41	206.32

Qn.No:3

Step No:1

Ans:: Draw a line joining the Reliability level of 99% the overall standard deviation S_0 of 0.49 and extend line to intersect the 1st TL line of point A

Step No:2

Draw a line joining point A to the ESAL of 2×10^6 and extend this line to intersect the 1st TL line at point B

Step 3::

Draw a line joining point B and reslint modulus (Mr) of base course and extend this line to intersect the design serviceability loss chart at point C

Step 4::

Draw a horizontal line ~~to~~ from point C to intersect the design ~~se~~ serviceability loss (PSI) curve at point D. So here ~~ΔPSI~~ $\Delta PSI = 4.5 - 2.5 = 2$

Step 5::

The structure number require to protect the base curve and to avoid this D1 of the surface course is 2.6

Step 6:

determine the appreciate Structure layer Co-efficient for each Construction material resultant value of asphalt = 450,000 lb/in²

therefore

$a_1 = 0.44$

$D_1 = SN_1 / a_1$

$= 2.6 / 0.44$

$= 5.9^2$

thickness should be taken to the nearest 0.5 inches so the thickness of the Surface Course is 6"

$SN_1 = D_1 \times a_1$

6×0.44

2.64

Now find SN_2 and D_2 (Base course)

find the value of a_2 from layer coefficient table and M_2 from drainage coefficient table

Thickness of base course (D_2).

$D_2 = (SN_1 - SN_2)$

$D_2 = 8$

$D_2 = (SN_1 - SN_2) / a_2 . M_2$

$D_1 = (3.8 - 2.63) / .14 \times 0.80$

$D_2 = 10.30''$

use 12''

So the thickness of base course is 12''

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

$SN_2 = 1.34 + 2.64$

$SN_2 = 3.98$

Finding SN_3 and D_3 Subbase course and also layer coefficient a_3 and drainage coefficent M_1 from their respective table

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

$D_3 = \frac{(4.4 - 3.98)}{0.10 \times 0.80}$

$D_3 = 5.24''$

we will use $6''$ as a sub base

$SN_3 = 2.64 + 1.3 \times 6'' \times 0.10 \times 0.80$

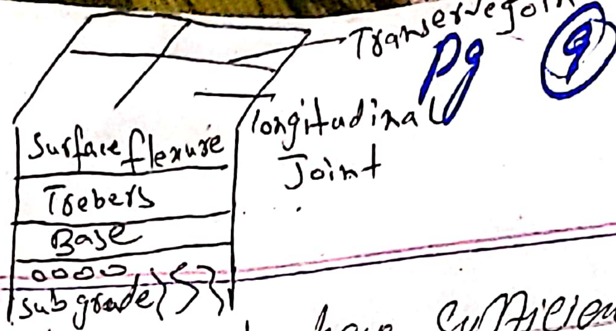
$SN_3 = 4.48 > 4.4$ okey.

<u>final design</u>

Surface Course = $6''$
Base Course = $12''$
Sub base = $6''$
Total pavement Thickness = $24''$

QNo: 4 different Pavement distresses?

Ans: <u>introduction</u>: A highway pavement a structure of consisting super imposed layers of processed ~~vati~~ material the pavement structure should be able of provide a surface of acceptable riding quality Adequate skid resistance favorable light reflecting Charateristic and low noise pollution



Rigid Pavement

Rigid pavement have sufficient flexural strength to transmit the wheel load stresses to a winder area below. In rigid pavement load is distribute by slab action

Factor affecting Pavement Performance

→ Traffic compact process wheel loading Axle configuration moving load
→ Structural model elastic model
→ Material Charaterization
→ Environment factor temp moisture

Common Rigid Pavement Distress

① spalling ② faulting ③ cracking
④ longitudinal crack ⑤ slab cracking
⑥ Durability cracking ⑦ polished Aggregates
⑧ Dumping and water Bleeding
⑨ Shrinkage cracking

Details

(1) **Spalling At the joint**: cracking breaking or chipping of joints/crack edges usually occurs with in about 0.6m (2ft) of joint/cracking. It causes of infiltration of incompressible matrial and subsequent expression (can also cause blowsups)

2) **Faulting** :: A difference in elevation across a joint or crack usually associated with undowled JPCP. usually the approch slab is lighter then the leave slab due to pumping

3) **Longitudinal cracking**
Longitudinal crack not associated with corner breaks or blowsup that extend across the entire slab into two or four pieces.

4) **CORNER Cracking** ::
A slab that interest the slab joint near the corner with in about 2m (7ft) or so A extend through the entire slab and caused by high corner stress

5) **Rutting** :: Surface depression in a wheel path are particulary evident after a rain when they are filled with water

Cause:
① insufficient compaction ② Subgrade routing
③ improper mix design

Repair ① slight ruts (< ½ inch deep)

6) **Bleeding** loss of skid resistance when wet

Causes

exessive asphalt binder in the HMA
Exessive application of Asphalt binder during BST application.

IV polished aggregate:

Causes:

Repeated traffic application this can be occur quiker in the aggregate is susceptible to obsersion.