Flexible Pavement Overlays
[in accordance with Investigation 630]

1. Obtain at least ten deflection tests in each mile of road.

2. Convert the FWD deflections to Benkelman Beam equivalents, BB_{eq}.

$$\mathbf{BB_{eq} = 5.15 + 1.05 \times D1_{(9k)}}$$

Where: BB_{eq} = Equivalent Benkelman Beam deflection, in mils
$FWD_{D1(9k)}$ = FWD No.1 sensor deflection normalized to 9,000 lbs, in mils

3. Average the ten deflections in each mile

4. Calculate the standard deviation for each mile

$$\mathbf{Standard\ Deviation} = \sqrt{\frac{(BB - \overline{BB})^2}{(n-1)}}$$

5. Correct the average of the individual deflections, $\overline{BB}$ to 80 °F

6. Calculate the "Present Design Deflection", $\overline{BB} + 2sd$, by adding two standard deviations to the average deflection corrected for temperature.

7. Convert the "Present Design Deflection" to "Design Spring Deflection" , **SBB** by multiplying by the appropriate deflection ratio.

8. Compute new "Design Spring Deflection" , $\mathbf{SBB_{new}}$ by multiplying original "Design Spring Deflection" , $\mathbf{SBB_{orig}}$ by the appropriate reduction factor.

$$\mathbf{SBB_{new} = SBB_{orig} \times \left[1 - (R \times ol)\right] \quad (simple\ rate)}$$

where: R = Reduction Rate (typ 0.11)
ol = Overlay Thickness

9. Find the "Allowable Spring Deflection", **ABB** for the particular pavement. *{from the Allowable Spring Deflections Table}*

10. Compute the “Allowable Spring Axle Load”.

$$L_A = L_D \times \frac{ABB}{SBB_{new}}$$

Where:
L_A = Allowable Spring Axle Load, tons
L_D = axle load used for deflection testing, tons
ABB = Allowable Spring Deflection, mils
SBB_{new} = Design Spring Deflection, mils

Benkelman Beam deflection corrections to 80 °F

Range of Deflection (mils)	Temperature °F				
	to 35	36 - 45	46 - 55	56 - 65	66 - 75
0 - 10	**5**	**4**	**3**	**2**	**1**
10 - 20	**7**	**6**	**4**	**3**	**1**
20 - 30	**10**	**8**	**6**	**4**	**2**
30 - 40	**10**	**8**	**6**	**4**	**2**
40 - 50	**12**	**10**	**7**	**5**	**2**
50 - 60	**15**	**12**	**9**	**6**	**3**

Allowable Spring Deflections

Traffic	Two-Way HCADT	< 50	50 - 100	100 - 150	> 150
	Two-Way ADT	< 500	500 - 1000	1000 - 3000	> 3000
Bituminous Surface Thickness		Allowable Deflection (mils)			
< 3 in.		**75**	**70**	**60**	**45**
3 to 6 in.		**65**	**60**	**50**	**40**
> 6 in.		**55**	**50**	**40**	**35**

Deflection ratios to calculate critical spring deflections from deflections taken during other non-frozen times of the year (1983 Revision)

PLASTIC EMBANKMENTS									
Asphalt Surface Thickness	**Date of Test**								
	5/1	5/16	6/1	6/16	7/1	7/16	8/1	8/16	Sept.
	5/15	5/31	6/15	6/30	7/15	7/31	8/15	8/31	
≤ 2 in.	**1.12**	**1.29**	**1.44**	**1.53**	**1.60**	**1.65**	**1.69**	**1.73**	**1.79**
> 2 ≤ 3½	**1.17**	**1.34**	**1.50**	**1.59**	**1.63**	**1.67**	**1.71**	**1.73**	**1.75**
> 3½ ≤ 5½	**1.14**	**1.24**	**1.37**	**1.43**	**1.50**	**1.58**	**1.64**	**1.70**	**1.71**
> 5½ ≤ 8 in.	**1.17**	**1.25**	**1.25**	**1.25**	**1.26**	**1.30**	**1.41**	**1.50**	**1.55**
> 8 in. Conventional Construction	**1.13**	**1.18**	**1.16**	**1.13**	**1.15**	**1.18**	**1.29**	**1.37**	**1.45**
> 8 in. Full-Depth Construction	**1.12**	**1.16**	**1.16**	**1.10**	**1.09**	**1.15**	**1.33**	**1.46**	**1.55**

SEMI-PLASTIC EMBANKMENTS									
Asphalt Surface Thickness	**Date of Test**								
	5/1	5/16	6/1	6/16	7/1	7/16	8/1	8/16	Sept.
	5/15	5/31	6/15	6/30	7/15	7/31	8/15	8/31	
≤ 5 in.	**1.16**	**1.35**	**1.40**	**1.50**	**1.52**	**1.51**	**1.48**	**1.46**	**1.45**
> 5 in.	**1.29**	**1.40**	**1.46**	**1.50**	**1.54**	**1.58**	**1.64**	**1.69**	**1.71**

NON-PLASTIC EMBANKMENTS									
Asphalt Surface Thickness	**Date of Test**								
	5/1	5/16	6/1	6/16	7/1	7/16	8/1	8/16	Sept.
	5/15	5/31	6/15	6/30	7/15	7/31	8/15	8/31	
≤ 2 in.	**1.30**	**1.41**	**1.72**	**1.79**	**1.83**	**1.83**	**1.88**	**1.88**	**1.88**
> 2 ≤ 5½	**1.21**	**1.36**	**1.47**	**1.53**	**1.58**	**1.56**	**1.52**	**1.49**	**1.44**
> 5½ ≤ 8 in.	**1.00**	**1.02**	**0.98**	**1.00**	**1.05**	**1.05**	**1.07**	**1.11**	**1.11**