Problem-1

A roadway is designed for a speed of 120 km/hr. At one horizontal curve, it is known that the superelevation is 8.0% and side friction factor is 0.09. Determine the minimum radius of the curve (measured to the traveled path) that will provide safe vehicle operating.

Problem-2

- What is the minimum radius of curvature allowable for a roadway with a 100 km/hr design speed, assuming allowable super elevation rate is 0.12. Compare this with the minimum curve radius recommended by AASHTO.
- What is the actual maximum super elevation rate allowable under AASHTO recommended standards for a 100 km/hr design speed, if the value of f is the maximum allowed by AASHTO for this speed.

Problem 1

Data:

$V = 120$ km/h

$e = 8\%$

$f = 0.09$

$R_{min} = ?$

Sol:

$$R_{min} = \frac{V^2}{127(e+f)}$$

$$= \frac{120^2}{127(0.08+0.09)}$$

$R_{min} = 667$ m According to AASHTO

For this Radius, e will be → $R_{min} = 870$ m

$$870 = \frac{120^2}{127(e+0.09)}$$

$e = 4.03\%$

Prob 2

Data:

$R_{min} = ?$

$V = 100$ km/h

$e = 0.12$

Compare with AASHTO

actual $e_{max} = ?$

Sol:

$f = 0.12$

$$R_{min} = \frac{100^2}{127(0.12+0.12)}$$

$= 328$ m

According to AASHTO

$R_{min} = 490$ m

↓

$$490 = \frac{100^2}{127(0.12+e)}$$

$e = 4.07\%$

Problem-3

- Determine a proper superelevation rate for a low volume, gravel surface road with a design speed of 50 mph and a degree of curvature of 8 degrees.

Prob 3

Data:

$e = ?$

$V = 50 \text{ mph} = 80 \text{ km/h} \Rightarrow f = 0.14$

$D = 8^\circ$

Sol:

$$D = \frac{5730}{R_{min}}$$

$$R_{min} = \frac{5730}{8^\circ} = 716.28 \text{ m}$$

$$R_{min} = \frac{V^2}{15(e+f)}$$

$$716.28 = \frac{50^2}{15(e+0.14)}$$

$$\boxed{e = 9.27\%}$$