

Answer on Question #73536, Physics / Mechanics — Relativity

Question During a freeway safety review, you are studying a curve that is essentially $1/8$ of a circle with a radius of 0.5 miles. The curve is banked so that the road makes an angle of 4 degrees to the horizontal throughout the curve. Your job is to begin the review by considering the worst-case scenario, a slick, ice-covered road, and finding the speed a standard passenger car (about 2000 lbs) must travel in order to maintain a horizontal path through the turn. The team you are working with will use this information along with other data to determine the speed limit on this road

Solution Limit speed can be found from condition of equality of accelerations due to gravity and due to circle movement:

$$\frac{v^2}{r} = g \sin \alpha$$

where $\alpha = 4^\circ$, $r = 0.5$ miles $= 804.7m$ and $g = 9.8 \text{ m/s}^2$. From this we find limiting speed:

$$v = \sqrt{rg \sin \alpha} = \sqrt{804.7 \cdot 9.8 \cdot 0.07} \approx 23.5 \text{ m/s}$$