

Section 2.5 Physics of Tailgating

Reaction time includes the time taken for this processing plus the time for your foot to move to the brake. Typical reaction times are between 0.2 and 0.7 seconds.

Calculating Stopping Distance

Initially you are travelling along at some constant velocity before your foot hits the brake. The distance travelled during the reaction time is given by $d = v_1 t$, where v_1 is the initial velocity.

Calculating Stopping Distance if Cars have Identical Braking Capacity

Assume that two Lincoln Continentals are travelling along a highway at 97 km/h. The front car slams on its brakes. Determine the minimum distance that the second Lincoln should have been behind the first to avoid a rear end collision given that the driver's reaction time was 0.45 s and the maximum deceleration of the Lincoln is 9.0 m/s^2 .

Calculating Stopping Distance if Cars have Different Braking Capacities

Two cars are travelling at 121 km/h with a separation distance of 5 car lengths (approx. 24.38 m). Car A decelerates at 9.8 m/s^2 (a BMW), while car B decelerates at 7.5 m/s^2 (a Chevrolet Blazer).

- A) If the driver of car B has a reaction time of 0.45 s, show that car B will in fact hit car A even at 5 car lengths away.
- B) How fast will car B be going when it hits Car A?

2. What is the stopping distance of a Toyota Celica ($a = -9.2 \text{ m/s}^2$) from 97 km/h where the driver has a reaction time of 0.55 s?
3. A Chevrolet Blazer travelling at 97 km/h can stop in 48 m. Given that the actual stopping distance for a certain driver is 54 m, what was the driver's reaction time?
4. A driver of a car going at 90.0 km/h suddenly sees the lights of a barrier 45 m ahead. If the driver applies the brakes and the average acceleration during braking is 10.0 m/s^2 , determine whether or not the car hits the barrier. The driver's reaction time is 0.75 s.
5. An automobile is travelling at 25 m/s on a country road when the driver suddenly notices a cow in the road 30.0 m ahead. The driver attempts to brake the automobile but the distance is too short. With what velocity would the car hit the cow if the car decelerated at 7.84 m/s^2 and the driver's reaction time was 0.75 s?