Vehicle Stopping Distance and Time

Highway traffic and safety engineers have some general guidelines they have developed over the years and hold now as standards. As an example, if a street surface is dry, the average driver can safely decelerate an automobile or light truck with reasonably good tires at the rate of about 15 feet per second (fps). That is, a driver can slow down at this rate without anticipated probability that control of the vehicle will be lost in the process.

The measure of velocity is distance divided by time (fps), stated as feet per second. The measure of acceleration (or deceleration in this case) is feet per second per second. That assumes a reasonably good co-efficient of friction of about .75; better is .8 or higher while conditions or tire quality might yield a worse factor of .7 or lower.

No matter the velocity, that velocity is reduced 15 fps every second. If the initial velocity is 60 mph, 88 fps, after 1 second elapsed, the vehicle velocity would be 73 fps, after 2 seconds it would be 58 fps decreasing progressively thereafter. For the true mathematical perfectionist (one who carries PI to 1000 decimal places), it would have been technically correct to indicated the formula is 'fpsps' rather than 'fps', but far less understandable to most drivers. Since at speeds of 200 mph or less, the difference from one method to the other is in thousanths of seconds, our calculations in these examples are based on the simple fps calculations.

Given the previous set of conditions, it would mean that a driver could stop the described vehicle in a total of 6.87 seconds (including a 1 second delay for driver reaction) and your total stopping distance would be 302.28 feet, slightly more than a football field in length!

Virtually all current production vehicles' published road braking performance tests indicate stopping distances from 60 mph that are typically 120 to 140 feet, slightly less than half of the projected safety distances. While the figures are probably achievable, they are not realistic and certainly not average; they tend to be misleading and to those that actually read them, they create a false sense of security.

By increasing braking skills, drivers can significantly reduce both the time it takes to stop and the distance taken to stop a vehicle. Under closed course conditions, professional drivers frequently achieve 1g deceleration (32 fpsps) or better. A reasonably skilled driver could easily get deceleration rates in excess of 20 fpsps without loss of control. It is very possible and probable that with some effort, the driver that attempts to be aware of braking safety procedures and practices can and should get much better braking (safely) than the guidelines used nationally, approaching that of the professionally driver published performance tests.

To determine how long it will take a driver to stop a vehicle, assuming a constant rate of deceleration, the process is to divide the initial velocity (in fps) by the rate of deceleration. You may want to use our **Vehicle Stopping Distance Calculator** to do

actual model calculations.

60 MPH = 88 fps. (fps=1.467 * MPH). If the vehicle deceleration rate is 20 fpsps (rather than the previously calculated 15 fps), then stopping time = 88/20 = 4.4 seconds. Since there is a 1 second delay (driver reaction time) in hitting your brakes (both recognition and reaction time is often 2 seconds), the total time to stop is 5.4 seconds to 6.4 seconds.

To determine how far the vehicle will travel while braking, use the formula of 1/2 the initial velocity multiplied by the time required to stop. In this case, this works out to be .5 * 88 * 4.4 = 193.6 feet, plus a reaction time of either 88 feet for a second delay in reaction time, or 176 feet for two seconds reaction time. That yields 281.6 feet or 369.6 when added to the base stopping distance of 193.6 feet. If the driver is very responsive and takes only a half a second to react, the distance is reduced to 237.6 feet. Notice that the reaction time is a huge factor since it is at initial velocity.

Based on pure math, it is evident that there is a very large difference in the reported performance tests and reality. Assuming a deceleration rate of 32 fpsps (1g), calculations indicate a braking stop time of 2.75 seconds (88/32). Distance traveled now is calculated to be 121 feet, which is for all practical purposed, the published performance figures, excluding reaction times.

The intelligent driver will error on the safe side and leave room for reaction time and less than perfect conditions. That driver will also hone the braking skills to give more of a margin of safety. That margin can save lives. Pay attention to the need to react quickly.

Braking/Stopping Distances

MPH	Ft./Sec.	Braking Deceleration Distance	Perception Reaction Distance	Total Stopping Distance
10	14.7	5	22	27
15	22	11	33	44
20	29.3	19	44	63
25	36	30	55	85
30	44	43	66	109
35	51.3	59	77	136
40	58.7	76	88	164
45	66	97	99	196
50	73.3	119	110	229
55	80.7	144	121	265
60	88	172	132	304
65	95.3	202	143	345
70	102.7	234	154	388
75	110	268	165	433
80	117.3	305	176	481
85	124.7	345	187	532
90	132	386	198	584