

Deceleration of vehicle and passenger compartment on impact with stationary and movable obstacle.

It is important to study the deceleration inside passenger compartment to know the effect of crash completely, so that the crash avoidance systems can be suitably designed. For example, if the deceleration of the passenger after crash is very high, the air bag system and the seat belt system has to be so designed that the activation time for them is reduced to a lower value.

Otherwise it may lead to injuries and fatalities.

Usually tests are conducted to know the deceleration behavior after the crash with a stationary obstacle. The tests are conducted at the following speeds:

15 mph test:

The following pictures show the body deformation and acceleration graph after crash. The body deformation is less as the vehicle speed is low. The crash occurs at time 0 seconds. From the graph, we can know that after the crash, deceleration occurs which is shown in the negative (lower) portion. Its value is up to 20g. After some time the acceleration slowly comes to zero (the car stops)

20 mph test:

In the 20 mph test, the body deformation is more than 15 mph test. Moreover, the acceleration has reduced to a further lower value (up to 35 g) in the negative direction. In this case the maximum deceleration is obtained in 50 milli seconds whereas for 10 mph test it was 35 milli seconds. The rebound velocity for this case is 1.7 mph whereas for 10 mph it is 1.3 mph. 40 mph test: In the 40 mph test, we can see that the acceleration curve goes down (deceleration) then suddenly goes up in the positive region (acceleration). This is due to the fact that, at 40 mph, the deformation is more and the accelerometer (sensor) mounting area has buckled and resulted in an increase in acceleration value. The body deformation is also high such that the accelerometer mounting area is also damaged. So, we have to carefully analyze the graph to study the situation. The graphs are shown below:

40 mph test:

In the 40 mph test, we can see that the acceleration curve goes down (deceleration) then suddenly goes up in the positive region (acceleration). This is due to the fact that, at 40 mph, the deformation is more and the accelerometer (sensor) mounting area has buckled and resulted in an increase in acceleration value. The body deformation is also high such that the accelerometer mounting area is also damaged. So, we have to carefully analyze the graph to study the situation.

50 mph test:

The body deformation is very high as the speed is more. The acceleration curve shows that the maximum deceleration is around 35g and happens in time duration of 45 milli seconds. The rebound velocity is 1.6 mph.

Deceleration on impact with a movable obstacle:

A movable obstacle can be another car or any other vehicle. Let us consider a car is impacting with another car. We shall study for the two cars; one car which is impacting the second car, the other car is which is being impacted. In this case the test is conducted at 40 mph.