

Why do modern cars damage so easily in a crash?

Have you ever jumped from a significant height and landed on your feet with straight legs? If you have, there's a good chance you felt pain afterwards. This is because there wasn't anything to absorb the shock from the ground to your feet and legs. That's why bent legs help when landing on your feet. The same principle applies to car accidents.



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Crumple Zones

(engine compartment, trunk)
deform to absorb energy and
control magnitude of deceleration

Safety Cage

(passenger compartment)
resists deformation to prevent intrusion

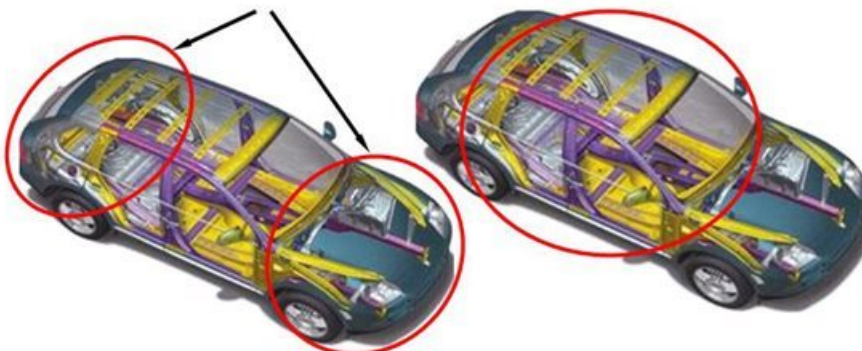


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Of course, stepping out of a vehicle that looks much like a crumpled tissue is sure to make you wonder just how safe you are. Most of us would feel more secure if we believed we had the protection of a rigid, unyielding tank. But, in fact, the opposite is true.

According to Richard Green, national director of the South African Motor Body Repairers Association (Sambra), an association of the Retail Motor Industry Organisation (RMI), most car manufacturers develop crumple zones on automobiles

because it helps absorb the shock of an impact and ensures that the force of the impact is absorbed within the crumple zone, rather than being transferred to the safety cell which surrounds the driver and passengers.

This is a delicate balancing act. Green further points out: “On the one hand, a car’s frame has to be strong enough to resist a certain amount of force, but too much resistance may lead to injury for the car’s inhabitants. Getting this balance right means considering the size and weight of the vehicle. You also need to think about the force that may arise if a car collides with a moving object as opposed to a stationary one. All of these dynamics must be taken into account.”

He adds that it’s not all up to the vehicle manufacturer. The driver and passenger also have a role to play by ensuring they are wearing seatbelts. “If not, the idea of a safety cell is compromised,” Green explains.

“ No matter how carefully a car’s crumple zones are designed, it’s inevitable that some force will remain unabsorbed. However, when you wear your seatbelt, you make sure that this is mitigated as far as possible. ”

This raises another question. If crumple zones make sure that most of the force of impact is absorbed or at least directed away from those inside the car, why not make the whole car a crumple zone? The answer to this, says Green, is because the ceilings, floors and doors folding on the passengers would spell certain disaster.

“That’s why the crumple zones are usually located at the front and back of the car, while the passenger cabin is far more rigid. Not that passengers are completely exposed or vulnerable, though. Where crumple zones handle external force, airbags ensure the driver and passenger do not make contact, upon impact, with the rigid dashboard or steering wheel inside the car,” he says.

The capsule where inhabitants sit, the safety cage, is also reinforced with pillars running the length of the car (from floor to ceiling), side-impact bars, the roof and the floor itself. These features ensure that the safety cage maintains its shape in the event of a collision.

Crumple zones have, in fact, been a key part of car design since as far back as 1932, when they were first introduced by Bela Barenji, an engineer for Mercedes-Benz. Although cars have obviously changed and evolved dramatically since then, Barenji’s concept of a vehicle sectioned into a rigid central zone surrounded by the front and back crumple zones remains unchanged.

Numerous tests have shown that a crumple zone can stop a car upon collision in 0.2 seconds as opposed to 0.1 seconds if the car, theoretically, did not have crumple zones. “In this scenario, the crumple zone therefore literally cuts the force of the crash in half.

All told, it means that you really have nothing to worry about if your car is severely damaged in a crash. Although it seems very wrong that an expensive item should fold in on itself in this manner, your car is doing exactly what it should – and making sure that you remain as safe as possible,” Green concludes.

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