



Structure

Programmed deformation of the structure protects the cabin. It dissipates the greatest amount possible of impact energy to preserve the cabin, which, on the contrary, being very stiff, acts as a survival cell. **Renault has for many years carried out highly advanced studies on the programmed deformation of the structure of its vehicles.**



RENAULT COMMUNICATION

› BASIC FACTS

To reduce the forces sustained by the occupants in an impact, the aim is to ensure it is the vehicle that absorbs as much as possible. To achieve this, it is divided into a number of zones that have different mechanical behaviour in terms of deformation. The front and rear are designed around deformable structures that act as shock absorbers at the moment of impact. The cabin, on the other hand, is stiffened to constitute a non-deformable space.

IN SHORT ›››

Through progressive deformation, the car structure absorbs the energy of the impact. The stiffened cabin undergoes less violent deceleration and behaves as a survival cell.



› HOW DOES IT WORK?

1 ABSORBING ENERGY

At the front, the distance between the bumper and the occupants of the car is exploited to the maximum to absorb the energy of the impact through programmed deformation. To achieve this, the stresses are distributed through the hollow sections of the cross-members. Their profile is also designed to absorb the impact as much as possible. To gain still further in effectiveness, Renault uses steels with very high yield-strengths, whose stiffness is two-and-a-half times higher than that of traditional steels. This characteristic gives them a high capacity to absorb impact energy. The same type of structure is found at the rear of the cabin at the level of the boot, where it is intended to deaden any rear collision. The placing of the stiffest and heaviest elements of the engine compartment, like the engine, the gear box and certain accessories, is also the object of careful study. Because their volume is incompressible, they limit the distance that is useable for energy absorption. These components are usually assembled laterally and, as far as possible, stacked up. This layout has the advantage of preserving the greatest possible area for the deformable space intended to deaden the impact.

2 DEFORMATION Dividing impact intensity by five

The programmed deformation of the structure makes it possible to significantly decrease the intensity of the impact and, therefore, its consequences. For example, at 50 kph in an extremely stiff car that only deforms 10 cm, at the moment of impact the occupants undergo deceleration which, at its start, is of a force that is equivalent to a hundred times their own

The cabin, on the other hand, must resist the intrusion of foreign elements. In the same way, it must in no case become an “accordion”, subjecting the passengers to the risk of being crushed. To achieve this and unlike the elements that surround it, it is stiffened to provide a non-deformable cell that protects the occupants. It is completely “ringed” with reinforced parts that constitute a protective belt. The doors are also equipped with pressed steel reinforcements and trimmed with shock-absorbent materials. The interior of the cabin, finally, is designed to deaden the impact of the occupants against its elements. The instrument panel, among other components, is designed from its shape, down to the “skin” that trims it, to deaden any possible impact. Lastly, all the elements likely to cause injury have been modified or moved. The rigid armrest, for example, has given way to a continuous ledge. In the same way, the steering column, essential but too stiff, has undergone major modifications to become retractable and has been covered with a padded trim.

weight (100 G). No human can survive such deceleration. On the other hand, during an identical impact, if the structure of the car provides for deformation of 80 cm, the acceleration undergone by its occupants will be eight times lower. This can be withstood by the human body.