

PASSENGER CAR BUMPERS - and Federal safety standard 581

The primary consideration in a Motor vehicle manufacturer's design and implementation of passenger car bumpers is to protect the vehicle to the extent of Federal Standard 581 - as opposed to protecting the passengers.

Passenger car bumpers are designed to contain the energy transferred from an impacting vehicle below a certain energy level by means of bumper impact shock absorbers or a resilient structure behind the bumper.

Bumper shock absorbers contain a spring or a gas/hydraulic system of relief for the storage of energy. As the force of the impact vehicle ebbs after their initial compression, the shock or resilient material converts stored energy to movement - thus causing significant bounce and/or restitution of form.

In the early 1970's, there was a standard for bumpers to be able to withstand an impact into a barrier at 5 mph without sustaining damage. This requirement was dropped in 1975 and was replaced with the current Federal Motor Vehicle Safety Standard (FMVSS) 581.1 - 581.7 - Bumper Standards.

This standard establishes requirements for the impact resistance of vehicles in low speed front and rear collisions.

The standard applies to passenger vehicles other than multipurpose MPV passenger vehicles. The code does not pertain to SUVs or trucks.

Requirements:

Each vehicle shall meet the damage criteria of 581.5(c)(1) through 581.5(c)(9) when impacted by a pendulum-type test device ** in accordance with the procedures of 581.7(b), under the conditions of 581.6, at an impact speed of 1.5 mph, and when impacted by a pendulum-type test device in accordance with the procedures of 581.7(a) at 2.5 mph, followed by an impact into a fixed collision barrier that is perpendicular to the line of travel of the vehicle, while traveling longitudinally forward, then longitudinally rearward, under the conditions of § 581.6, at 2.5 mph.

The vehicle's brakes are disengaged and the transmission in neutral during the pendulum tests and its engine is running at idle in the barrier test. Front & rear bumpers each are subjected to two straight-on impacts at least 12" apart at a height between 16 & 20". Each of the four bumper corners are subjected that the same pendulum blows.

** The pendulum has a 4 1/2" X 16" X 3" hardened steel Impact Ridge on the face of a steel block at the end of an 11" lever and shall impact the bumper with a force that exceeds 2000 pounds on the

combined surface of the pendulum. The effective impacting mass of the test device is equal to the mass of the tested vehicle.

After these tests the vehicle's exterior surfaces shall have no separations of surface materials, paint, polymeric coatings, or other covering materials from the surface to which they are bonded, and no permanent deviations from their original contours 30 minutes after completion of each pendulum and barrier impact, except where such damage occurs to the bumper face bar and the components and associated fasteners that directly attach the bumper face bar to the chassis frame.

The vehicle's hood trunk & doors must operate in the normal manner and its drivetrain, cooling system and exhaust system be free of damage.

581.4 - Bumper face bar means any component of the bumper system that contacts the impact ridge of the pendulum test device.

Reference: Code of Federal Regulations volume 49 - Transportation 10/1/91 Edition

Trucks, SUV's and mini vans are not included in this regulation.

The construction and composition of a bumper - plated steel, steel & vinyl, aluminum, Urethane, fiberglass - and the surface makeup (painted or not) of the rear bumpers of target vehicles and the front bumpers of bullet vehicles must be considered in a damage analysis. The thickness of steel or aluminum bumpers and the presence of rust, rot, old repairs or alterations such as a trailer hitch influence an analysis.

The means by which the bumper is attached to the chassis - be it a frame, a sub frame or unibody - through shocks, by means of cellular material, a fiberglass reinforcement must be identified and reported

These factors can be determined while examining a vehicle and document conditions under & behind the bumpers with photographs.

When a shock-equipped bumper is impacted evidence of shock travel should be photographed.

If the actual vehicle is unavailable an exemplar can be used for reference & measurements.

The dimensions of the profile (cross section) of a bumper - flat convex, concave, sectional should be recorded and photographed from the side for a profile view.